

National Water Conditions

UNITED STATES
Department of the Interior
Geological Survey

CANADA
Department of the Environment
Water Resources Branch

JANUARY 1991

STREAMFLOW DURING JANUARY



There was continuing extreme drought in most of California, severe drought in part of Florida, and moderate to extreme drought in parts of the West despite "wet" conditions in much of the rest of the United States.

Streamflow was in the normal to above-normal range at 79 percent of the index stations in the United States, southern Canada, and Puerto Rico, compared with 76 percent of stations in those ranges last month. Below-normal range streamflow occurred in 22 percent of the area of the conterminous United States and southern Canada, compared with 27 percent last month. Total flow for the 174 index stations in the conterminous United States and southern Canada was 34 percent above median and 14 percent greater than last month.

The combined flow of the 3 largest rivers in the lower 48 States--Mississippi, St. Lawrence, and Columbia--averaged 84 percent above median and in the above-normal range during January, 90 percent more than during December. Flow of the Mississippi River was a record high for January.

Monthend index reservoir contents were in the below-average range at 33 of 100 reporting sites, compared with 35 at the end December 1990, and the same as at the end of January 1990.

Mean January elevations at four master gages on the Great Lakes (provisional National Ocean Service data) were in the below-normal range on Lake Superior, in the normal range on Lake Huron, and in the above-normal range on both Lake Erie and Lake Ontario.

Utah's Great Salt Lake remained at 4,202.40 feet above National Geodetic Vertical Datum (NGVD) of 1929 during January as lake level remained steady for two months after peaking at 4,204.70 feet above NGVD of 1929 in March-April. The seasonal low of 4,202.20 feet above NGVD of 1929 occurred on November 22, 1990.

SURFACE-WATER CONDITIONS DURING JANUARY 1991

There was continuing drought in most of California and part of Florida. Both hydrologic conditions and water-supply outlook in California are discussed on pages 6-7. Much of Florida continues to have record or near-record low streamflow, lake, and ground-water levels. (See streamflow maps and pages 16-19.)

Streamflow was in the normal to above-normal range at 79 percent of the index stations in the United States, southern Canada, and Puerto Rico during January, compared with 76 percent of stations in those ranges during December, and 80 percent of stations in those ranges during January 1990. Below-normal range streamflow occurred in 22 percent of the area of the conterminous United States and southern Canada during January 1991, compared with 27 percent during December 1990 and 11 percent during January 1990. Total January 1991 flow of 876,200 cubic feet per second (cfs) for the 174 index stations in the conterminous United States and southern Canada was 34 percent above median, 14 percent greater than last month, and 4 percent greater than flow during January 1990.

Seven new extremes (table on page 4), three lows and four highs, occurred at streamflow index stations, compared with six lows and eight highs during December. The lows occurred at stations in California and Idaho, while the highs occurred at stations in West Virginia, Mississippi, Texas, and New Mexico. Hydrographs for those stations where new extremes occurred are on page 5, except that for the Mississippi River at Vicksburg, Mississippi, which is on page 8.

The combined flow of the 3 largest rivers in the lower 48 States—Mississippi, St. Lawrence, and Columbia—averaged a January record high of 1,839,000 cfs (84 percent above median and in the above-normal range), 90 percent more than during December, and exceeding the previous high during January 1974 by 9 percent. Flow of the St. Lawrence River was in the normal range for the eleventh consecutive month. Flow of the Mississippi River was in the above-normal range for the, after three consecutive months in the normal range, and a record high for January. Flow of the Columbia River was in the normal range after an above-normal range November and December, normal range October, and a below-normal September. Hydrographs for both the combined and individual flows of the "Big 3" are on page 8. Dissolved solids and water temperatures at five large river stations are also given on page 8. Flow data for the "Big 3" and 42 other large rivers are given in the Flow of Large Rivers table on page 9.

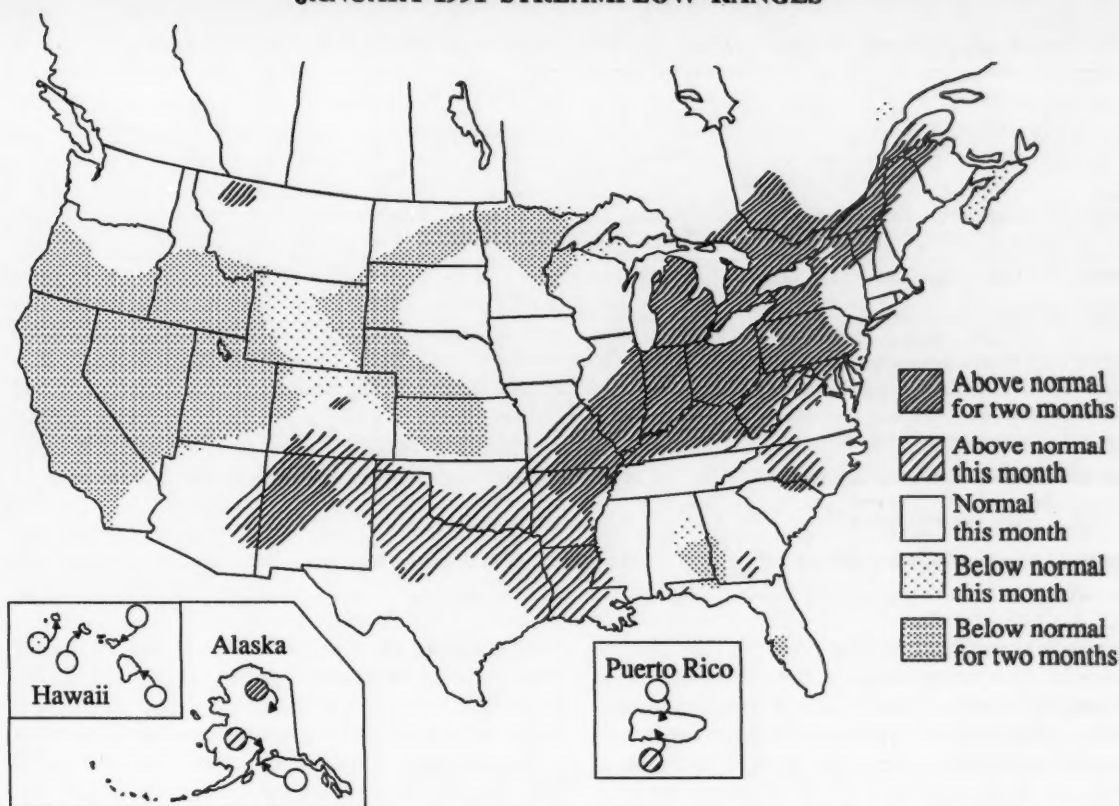
Monthend index reservoir contents for January 1990 were in the below-average range (below the monthend average for the period of record by more than 5 percent of normal maximum contents) at 33 of 100 reporting sites, compared with 35 at the end of December 1990, and the same as at the end of January 1990, including most reservoirs in Nebraska, the Dakotas, Montana, Idaho, Wyoming, Colorado, Utah, Nevada, and California. Contents were in the above-average range at 50 reservoirs (compared with 46 last month), including most

(Continued on page 4)

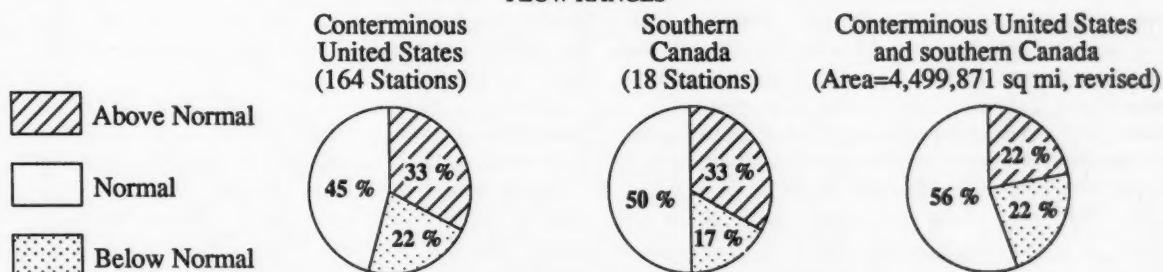
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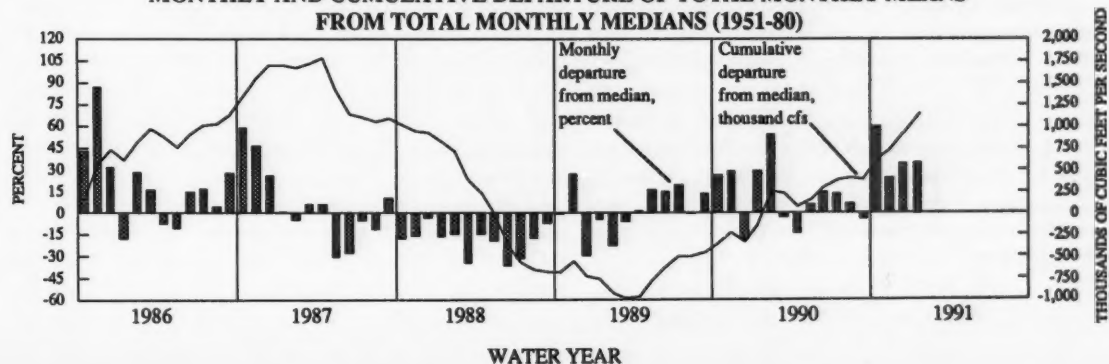
JANUARY 1991 STREAMFLOW RANGES



SUMMARY OF JANUARY 1991 STREAMFLOW FLOW RANGES



MONTHLY AND CUMULATIVE DEPARTURE OF TOTAL MONTHLY MEANS FROM TOTAL MONTHLY MEDIANS (1951-80)



NEW EXTREMES DURING JANUARY 1991 AT STREAMFLOW INDEX STATIONS

Station number	Stream and place of determination	Drainage area (square miles)	Years of record	Previous January extremes (period of record)		January 1991			Day
				Monthly mean in cfs (year)	Daily mean in cfs (year)	Monthly mean in cfs	Percent of median	Daily mean in cfs	
LOW FLOWS									
11098000	Arroyo Seco near Pasadena, California	16	79	0.79 (1926)	0.20 (1930)	0.54	9	0.17	*
11427000	North Fork American River at North Fork Dam, California	342	49	62.2 (1977)	36.0 (1977)	44.5	7	37.0	31
13037500	Snake River (adjusted) near Heise, Idaho	5,752	80	2,237 (1935)	1,030 (1988)	1,460	48	1,400	28
HIGH FLOWS									
01610000	Potomac River at Paw Paw, West Virginia	3,109	52	8,619 (1952)	33,300 (1978)	9,100	221	29,100	17
07289000	Mississippi River at Vicksburg, Mississippi	1,140,500	62	1,269,000 (1950)	1,740,000 (1950)	1,513,000	234	1,684,000	21
08033500	Neches River near Rockland, Texas	3,636	87	12,310 (1961)	35,800 (1920)	14,120	894	25,100	21
08378500	Pecos River near Pecos, New Mexico	189	71	49.7 (1942)	70.0 (1942)	50.2	234	.....	...

*Occurred more than once.

reservoirs in Maine, New Hampshire, Vermont, Massachusetts, New York, New Jersey, Maryland, the Carolinas, Georgia, Alabama, the Tennessee Valley, Texas, Oklahoma, Wisconsin, and Minnesota. Reservoirs with contents in the below-average range and significantly lower than last year (with normal maximum contents of at least 1,000,000 acre-feet) are: Lake McConaughy, Nebraska; Boise River, Idaho; Upper Snake River, Idaho-Wyoming; Bear Lake, Idaho-Utah; Folsom, Clair Engle Lake, Lake Berryessa, and Shasta Lake, California; and also the Colorado River Storage Project. Reservoirs with less than 10 percent of normal maximum contents (January average in parentheses) are: Isabella, 8 percent (27), and Pine Flat, 4 percent (49), California; Lake Tahoe, California-Nevada, 0 percent (49); and Rye Patch, Nevada, 1 percent (52). Graphs of contents for seven reservoirs are shown on page 10 with contents for the 100 reporting reservoirs given on page 11.

Mean January elevations at four master gages on the Great Lakes (provisional National Ocean Service data) were in the below-normal range on Lake Superior, in the normal range on Lake Huron, and in the above-normal range on both Lake Erie and Lake Ontario. Levels on all four lakes had been in the same ranges for seven months prior to January 1991. Levels fell from those for December on both Lake Superior and Lake Huron, and rose from those for last month on the other two lakes. January levels ranged from 0.28 foot lower (Lake Superior) to 0.95 foot higher (Lake Ontario) than those for December. Monthly means have now been in the below-normal range for 16 months on Lake Superior and in the normal range for 8 months on Lake Huron. The above-normal range means on Lake Erie and Lake Ontario ended many consecutive months of levels in the normal range on these two lakes, 33 months and 20 months, respectively. January 1991 levels ranged from 0.12 foot (Lake Superior) to

1.47 feet higher (Lake Erie) than those for January 1990. Stage hydrographs for the master gages on Lake Superior, Lake Huron, Lake Erie, and Lake Ontario are on page 12.

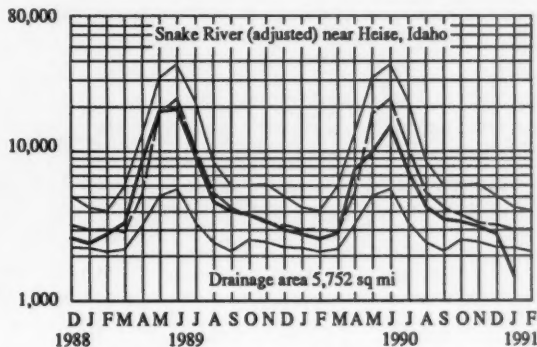
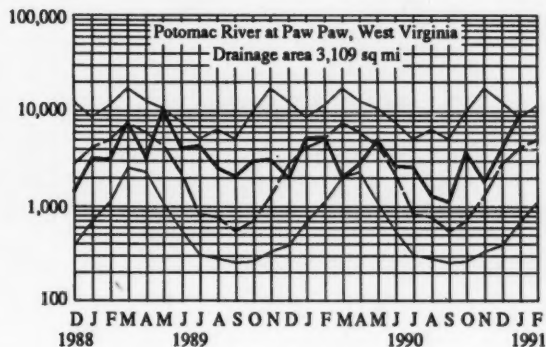
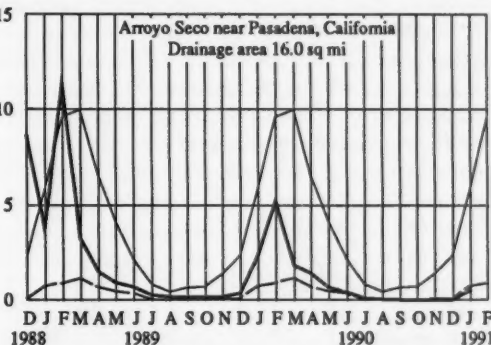
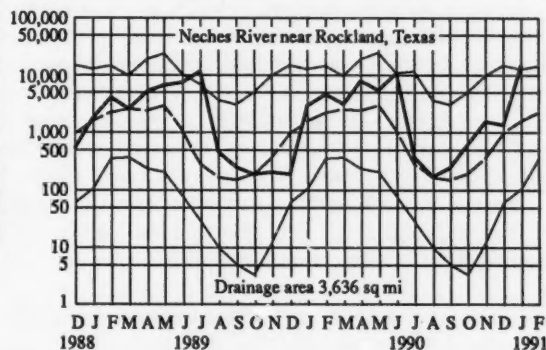
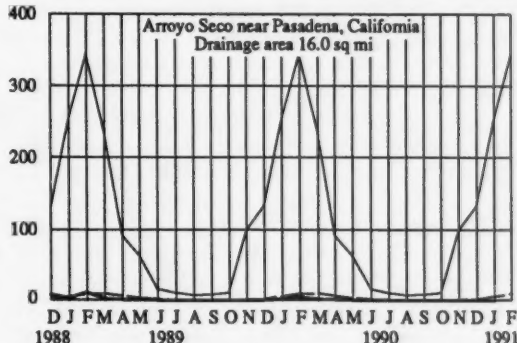
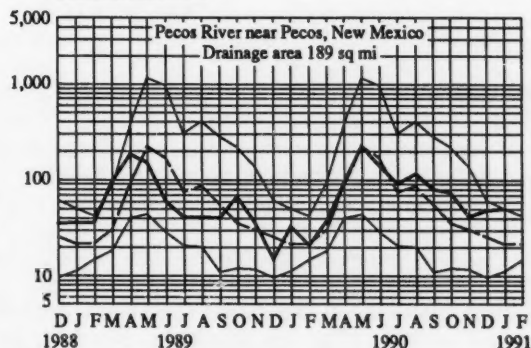
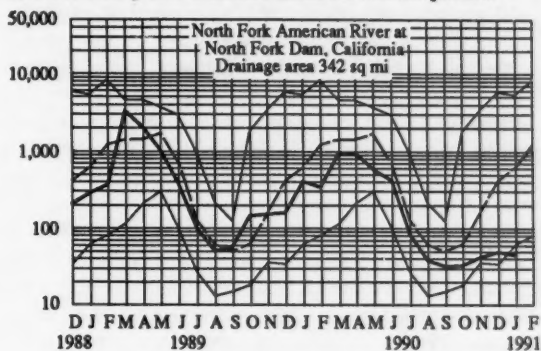
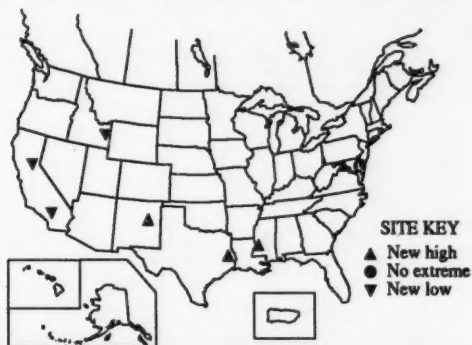
Utah's Great Salt Lake (graph on page 12) remained at 4,202.40 feet above National Geodetic Vertical Datum (NGVD) of 1929 during January as lake level remained steady for two months after peaking at 4,204.70 feet above NGVD of 1929 in March-April. The seasonal low of 4,202.20 feet above NGVD of 1929 occurred on November 22, 1990. Lake level is 2.10 feet lower than at the end of January 1990, and 9.45 feet lower than the maximum of record which occurred in June 1986 and March-April 1987.

Streamflow conditions for January 1991 and January 1990 are shown by maps on page 13. January 1991 has 200 percent as much area in the below-normal range, 22 percent more area in the above-normal range, and about 29 percent less area in the normal range than January 1989. Parts of Montana, Michigan, Ontario, Quebec, Vermont, New York, Pennsylvania, Ohio, Indiana, Virginia, West Virginia, Kentucky, North Carolina, Oklahoma, and Texas have streamflow in the above-normal range during both months. Parts of Washington, Idaho, Wyoming, North Dakota, Minnesota, Wisconsin, Michigan, Nova Scotia, California, Nevada, Utah, Colorado, Nebraska, and Kansas have streamflow in the below-normal range during both months. The locations of reservoirs with below-average contents at the end of January 1991 and January 1990 are also shown on the respective maps.

Graphs for 12 hydrologic areas show monthly percent departure of streamflow from median for the 1986-90 water years (page 14) and also compare monthly streamflow for the 1990 and 1991 water years with median monthly streamflow for 1951-80 (page 15).

MONTHLY MEAN DISCHARGE OF SELECTED STREAMS

Area between light-weight solid lines indicates range between highest and lowest record for the month. Dashed line indicates median of monthly values for reference period, 1951-80. Heavy line indicates mean for current period.



HYDROLOGIC CONDITIONS AND WATER-SUPPLY OUTLOOK IN CALIFORNIA

According to the *California Water Supply Outlook* (Department of Water Resources, Division of Flood Management, Flood operations and Hydrology Branches) of February 7, "the rainy season is now past the halfway mark with statewide accumulations only about 1/4 of average. The last half of January saw rainless weather over most of California during the heart of the normal rainy season. During the first 5 days of February, two storm systems did break through persistent high pressure to dump liberal amounts in northern California coastal and lowland areas. Northern Sierra amounts did not show the usual 3-4 fold increase over lowland amount, but were about the same. February Northern Sierra precipitation is about 30 percent of the average monthly amount (the best month this water year!) but this has raised the seasonal total to only about 25 percent of normal as of February 7.

"Snowpack water content appears to be only 10 to 12 percent of the average April 1 accumulation instead of the normal 65 percent for this date. The pack is comparable to that in drought year 1977.

"Due to poor January rainfall and dry antecedent conditions, estimated statewide runoff during January was only around 11 percent of average. Seasonal runoff since October 1 therefore, decreased to about 15 percent, less than in 1977, the driest runoff year of record.

"Water storage in the State's 155 major reservoirs as of February 1 was 11.9 million acre-feet, 50 percent of average. This is 5-1/2 MAF behind one year ago and about 1 MAF under the 1977 amount at this time. Storage during January decreased about 0.1 MAF; normally it would increase 1.3 MAF during the month.

"Runoff forecasts for the water year are about 1/3 of average, assuming normal future weather henceforth. There is a significant chance that runoff could be less than 1977. Water year 1991 is nearly certain to be critically dry, but the severity of drought—and the degree of water shortage—is still uncertain, depending much on rain and snow during the next 3 months."



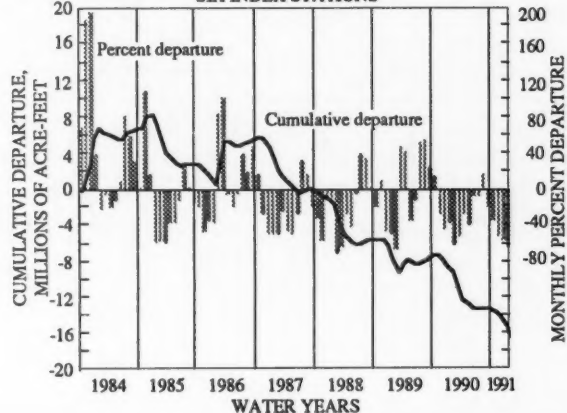
*Forecast by Department of Water and Power, City of Los Angeles, for the period April-September

SUMMARY OF PRECIPITATION BY DRAINAGE AREAS FEBRUARY 1, 1991

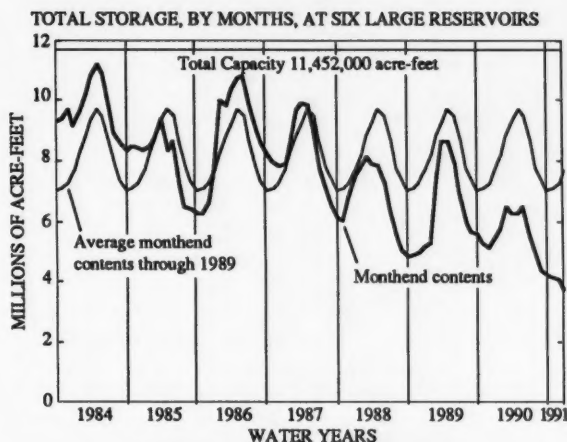
Drainage area	Drainage area weight, percent	Total number of stations	Percent of historical average	
			January	October-January
North coast	27	23	30	33
San Francisco	3	5	10	20
Central coast	6	11	22	21
South coast	6	18	46	28
Sacramento basin	26	58	12	23
San Joaquin	12	27	10	21
Tulare Lake basin	7	19	29	29
North Lahontan	4	8	16	25
South Lahontan	6	13	17	19
Colorado Desert	3	6	161	60
Statewide	100	188	25	27

Streamflow conditions at six California index stations from October 1983 through January 1991 show the monthly progression from a time of above-average precipitation and streamflow during the 1984 water year to the latest period of drought. Most of the precipitation which produces runoff and ground-water recharge in California occurs from November through February. Streamflow usually reaches seasonal lows during September-October in California. Over half of the combined median runoff at the six index stations occurs from December through March, the bulk of it during February. Snow at higher elevations, usually melting from March on, occasional rainfall, and ground-water discharge sustain streamflow for the rest of the year. The cumulative departure line is steepest when large monthly departures occur. The two best examples of this are February-March 1986—very wet months with severe floods during February and lesser floods during March, and each month having more than 80 percent above the median streamflow—and February-March 1988—very dry months, with each month having less than 35 percent of the median streamflow. State-wide precipitation for October 1990-January 1991 is the lowest for any October-January period since records began in January 1895, according to the National Climatic Data Center of the National Oceanic and Atmospheric Administration. (See page 21)

DEPARTURE FROM TOTAL MONTHLY MEDIAN STREAMFLOW AT SIX INDEX STATIONS



Total storage for six large reservoirs in California (graph below) shows clearly the progression from the wet conditions of the 1984 water year through the current drought years, ending in January 1991. Reservoir contents declined during the 1985 water year, but increased greatly during the floods of February-March 1986, as previously indicated with regard to cumulative streamflow departures. The six large reservoirs are those with normal maximum contents of 1,000,000 acre-feet or more as shown in the reservoir table on page 11: Folsom, Pine Flat, Clair Engle (Lewiston), Lake Almanor, Lake Berryessa, and Shasta Lake.



California: Anatomy of a Drought

(From *Weekly Weather and Crop Bulletin*, prepared and published by the NOAA/USDA Joint Agricultural Weather Facility)

More than halfway through the 1990-91 rainy season, California needs to erase huge rainfall deficits to avert a fifth consecutive dry year. Through the end of January, the 1991 water year is running marginally drier than 1977, the driest year on record. More than 90 percent of California's precipitation falls between October and April. If drought prevails, it will be the first time in 96 years of record-keeping that California has endured 5 significantly drier-than-normal years in a row. Compounding the State's water shortage is demographic change: California's population has quadrupled in the past 50 years and agricultural water demands have increased.

Previously, the driest periods on record in California have been:

Water years	Length	Remarks
1896-1900	5 years	Only 1898 and 1899 were critically dry.
1928-1934	6 of 7 yrs.	Precipitation was normal in 1932.
1944-1950	7 years	No single year was critically dry.
1959-1962	4 years	No single year was critically dry.
1975-1977	3 years	1976: 4th driest; 1977: driest ever.

The current drought began during the 1987 water year, which was the fifth driest on record. The State has not received widespread relief since. With each passing year, California's wettest/snowiest region, the Sierra Nevada range, has noted decreasing precipitation. This has squelched spring runoff as winter snowpack has diminished. Annual precipitation in the Sierras has steadily dwindled from near normal in 1986 to less than 75 percent of normal in 1988, and to only about 50 percent of normal in 1990. Currently, the entire State is in a condition of moderate, severe, or

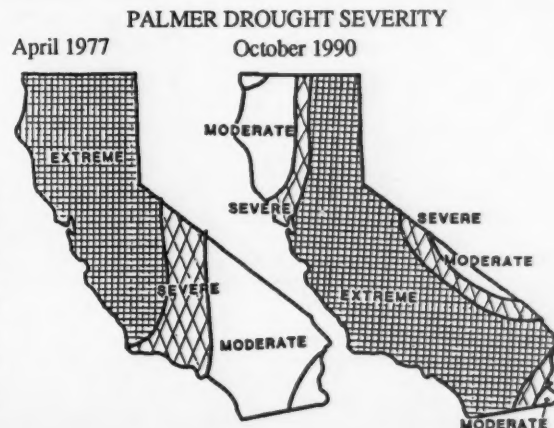
extreme drought, according to the Palmer Drought Index. Human geography is also straining diminished water supplies more than during previous droughts. California's population has exploded from 1.5 million at the turn of the century to 6.9 million in 1940, and then to nearly 30 million today. With an average water usage of 100 gallons per person per day, residential water consumption alone has jumped more than 600 million gallons a day since the drought of 1977. Irrigation demands also have increased due to both expanding agricultural practices and lack of rainfall.

How does 1991 compare with 1977 in terms of drought severity? Not only has water year 1991 been slightly drier than 1977 (through January), but 1991 comes on the heels of 4 very dry years as well. The drought of 1977 was a continuation of only 2 previous dry years. Statewide precipitation was about 35 percent of normal in 1977. During the current water year, precipitation has totaled 25 percent of normal. In 1977, it was drier along the north coast and in the southern San Joaquin Valley. This year it is drier in most areas of northeastern, central, and southern California. (See maps below.)

PERCENTAGE OF NORMAL PRECIPITATION
October 1976-January 1977 October 1990-January 1991

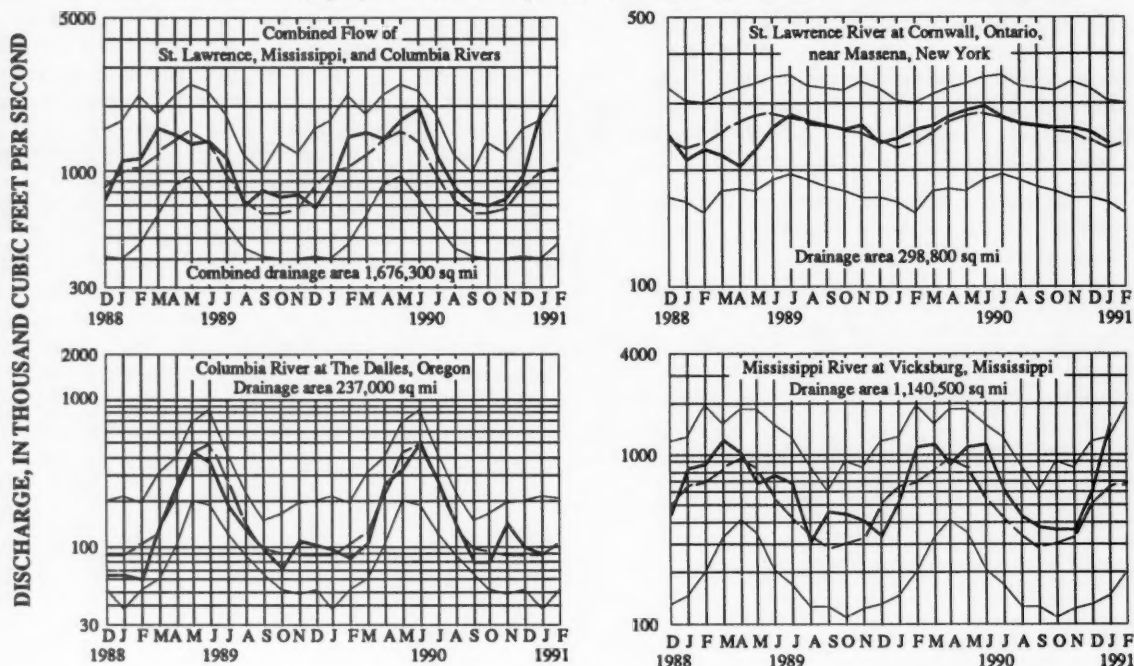


The Palmer Drought Severity maps below indicate that 1991 began with drought conditions nearly as serious as they were toward the end of the 1977 drought. The difference is that the most stricken region in 1977 was northern California. This year, southern and northeastern California are experiencing the most extreme drought.



HYDROGRAPHS FOR THE "BIG THREE" RIVERS

Area between light-weight solid lines indicates range between highest and lowest record for the month. Dashed line indicates median of monthly values for reference period, 1951-80. Heavy line indicates mean for current period.



Provisional data; subject to revision

DISSOLVED SOLIDS AND WATER TEMPERATURES, FOR JANUARY 1991, AT DOWNSTREAM SITES ON FIVE LARGE RIVERS

Station number	Station name	December data of following calendar years	Stream discharge during month Mean (cfs)	Dissolved-solids concentration ¹		Dissolved-solids discharge ¹			Water temperature ²		
				Mini- mum (mg/L)	Maxi- mum (mg/L)	Mean (tons per day)	Mini- mum	Maxi- mum	Mean in °C	Mini- mum in °C	Maxi- mum in °C
01463500	Delaware River at Trenton, New Jersey, (Morrisville, Pennsylvania)	1991 1945-90 (Extreme yr)	15,950 12,410 410,440	76 62 (1951, 1960)	110 201 (1959)	4,123 32,462 (1981)	2,694 758 (1981)	7,590 20,800 (1976)	2.5 31.5 0	0.5 0	3.5 7.5
07289000	Mississippi River at Vicksburg, Mississippi	1991 1976-90 (Extreme yr)	1,513,400 658,400 4645,700	149 157 (1979)	177 299 (1981)	659,400 350,200 (1981)	549,200 128,000 (1981)	735,300 655,100 (1988)	5.0 4.5 0	4.5 0	6.5 10.0
03612500	Ohio River at lock and dam 53, near Grand Chain, Illinois, (streamflow station at Metropolis, Illinois)	1991 1955-90 (Extreme yr)	926,400 359,600 4362,300	130 98 (1973)	189 382 (1964)	..... ..... (1956)	172,000 28,500 (1956)	518,000 489,000 (1989)	...	4.0 0	8.5 10.0
06934500	Missouri River at Hermann, Missouri, (60 miles west of St. Louis, Missouri)	1991 1976-90 (Extreme yr)	50,600 48,410 433,290	267 159 (1979)	428 553 (1977)	52,500 55,740 (1981)	26,900 18,100 (1981)	94,500 160,000 (1985)	2.0 2.5 0	1.0 0	3.0 7.5
14128910	Columbia River at Warrendale, Oregon (streamflow station at The Dalles, Oregon)	1991 1976-90 (Extreme yr)	193,000 169,800 486,480	93 76 (1978)	107 125 (1983)	51,700 48,060 (1979)	37,800 24,300 (1979)	64,600 79,800 (1984)	2.0 4.0 0	1.0 0	3.0 9.0

¹Dissolved-solids concentrations, when not analyzed directly, are calculated on basis of measurements of specific conductance.

²To convert °C to °F: [(1.8 x °C) + 32] = °F.

³Mean for 7-year period (1983-90).

⁴Median of monthly values for 30-year reference period, water years 1951-80, for comparison with data for current month.

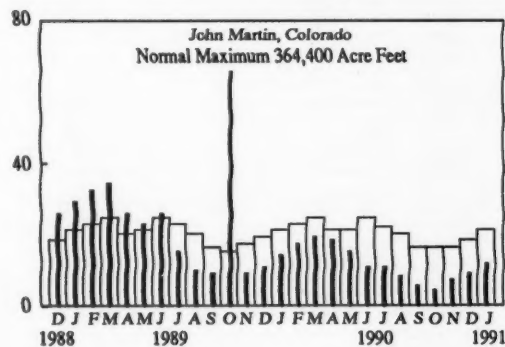
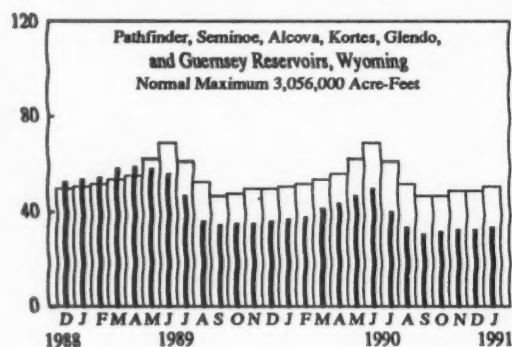
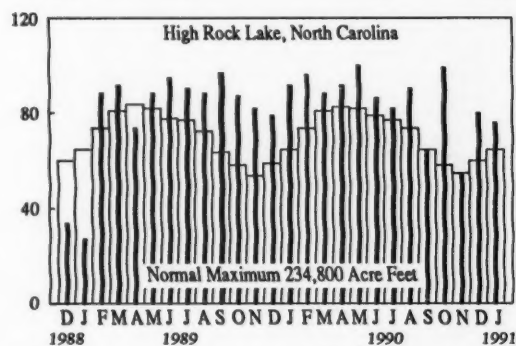
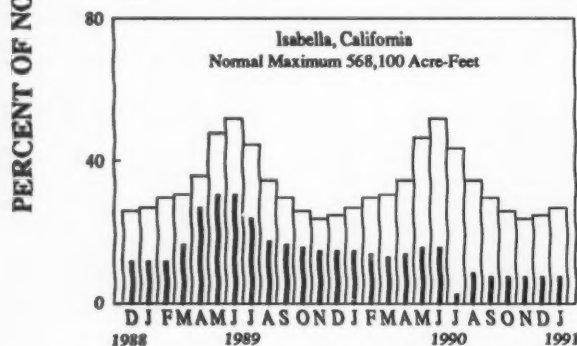
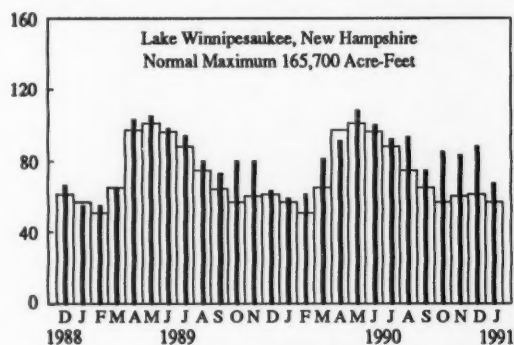
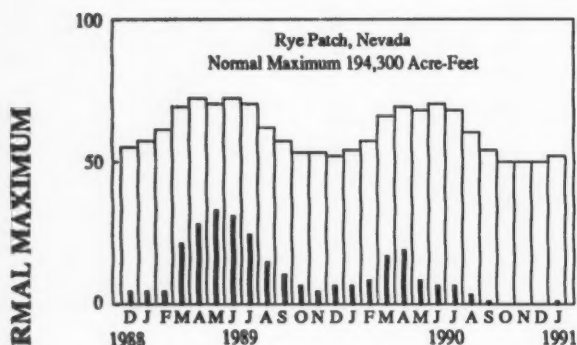
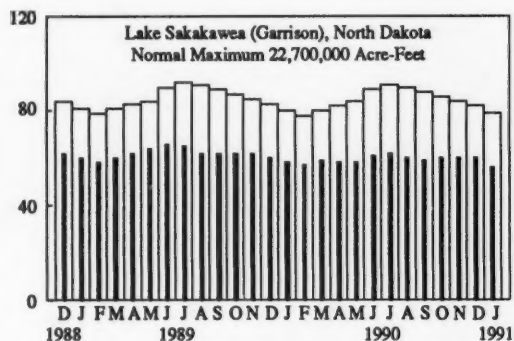
FLOW OF LARGE RIVERS DURING JANUARY 1991

Station number	Stream and place of determination	Drainage area (square miles)	Average discharge	Monthly mean discharge (cubic feet per second)	Percent of median monthly discharge 1951...80	January 1991			Date
			through September 1985 (cubic feet per second)			Change in discharge from previous month (percent)	Discharge near end of month		
							Cubic feet per second	Million gallons per day	
01014000	St. John River below Fish River at Fort Kent, Maine ...	5,665	9,758	4,772	169	-57	3,500	2,260	31
01318500	Hudson River at Hadley, New York.....	1,664	2,908	4,290	244	-19	2,120	1,370	31
01357500	Mohawk River at Cohoes, New York.....	3,456	5,683	6,490	138	-35	4,000	2,600	31
01463500	Delaware River at Trenton, New Jersey.....	6,780	11,670	15,950	153	-24	11,400	7,370	31
01570500	Susquehanna River at Harrisburg, Pennsylvania.....	24,100	34,340	62,680	182	-4	29,800	19,300	28
01646500	Potomac River near Washington, District of Columbia...	11,560	11,500	136,200	275	135	.....	.....	...
02105500	Cape Fear River at William O. Huke Lock, near Tarheel, North Carolina.	4,852	5,002	11,600	158	175	.....	.....	...
02131000	Pee Dee River at Pee Dee, South Carolina.....	8,830	9,871	23,640	168	113	20,600	13,300	31
02226000	Altamaha River at Doctortown, Georgia.....	13,600	13,730	18,400	113	235	42,000	27,100	31
02320500	Suwannee River at Branford, Florida.....	7,880	6,986	5,137	102	221	17,600	11,400	31
02358000	Apalachicola River at Chattahoochee, Florida.....	17,200	22,420	16,190	56	84	51,200	33,100	31
02467000	Tombigbee River at Demopolis lock and dam, near Coats, Alabama.	15,385	23,520	34,040	91	-18	36,300	23,500	31
02489500	Pearl River near Bogalusa, Louisiana.....	6,573	9,880	15,150	155	166	17,000	11,000	31
03049500	Allegheny River at Natrona, Pennsylvania.....	11,410	119,580	143,650	195	19	22,500	14,500	26
03085000	Monongahela River at Braddock, Pennsylvania.....	7,337	112,480	130,560	161	21	12,100	7,820	26
03193000	Kanawha River at Kanawha Falls, West Virginia.....	8,367	12,550	27,820	173	54	8,710	5,630	30
03234500	Scioto River at Higby, Ohio.....	5,131	4,583	15,000	265	-13	8,480	5,480	31
03294500	Ohio River at Louisville, Kentucky ^{2*}	91,170	115,800	144,700	95	-53	169,000	109,000	30
03377500	Wabash River at Mount Carmel, Illinois.....	28,635	27,660	101,600	395	68	50,400	32,600	31
03469000	French Broad River below Douglas Dam, Tennessee ^{3*} ..	4,543	16,739	17,414	86	3	.....	.....	...
04084500	Fox River at Rapids Croche Dam, near Wrightstown, Wisconsin. ²	6,010	4,238	3,453	95	1	3,430	2,210	31
04264331	St. Lawrence River at Cornwall, Ontario, near Massena, New York. ^{4*}	298,800	243,900	237,000	104	-6	260,000	168,000	31
02NG001	St. Maurice River at Grand Mere, Quebec.....	16,300	24,910	6,150	83	-72	22,600	14,600	31
05082500	Red River of the North at Grand Forks, North Dakota...	30,100	2,593	186	17	-16	186	120	30
05133500	Rainy River at Manitou Rapids, Minnesota.....	19,400	12,920	7,500	78	12	6,700	4,330	25
05330000	Minnesota River near Jordan, Minnesota.....	16,200	3,680	394	81	-13	375	242	31
05331000	Mississippi River at St. Paul, Minnesota ⁵	36,800	111,020	3,140	65	-12	3,040	1,960	31
05365500	Chippewa River at Chippewa Falls, Wisconsin.....	5,650	5,149	1,940	65	-19	1,750	1,130	31
05407000	Wisconsin River at Muscoda, Wisconsin.....	10,400	8,710	6,745	112	7	5,800	3,750	31
05446500	Rock River near Joslin, Illinois.....	9,549	6,080	3,790	103	-40	3,000	1,900	31
05474500	Mississippi River at Keokuk, Iowa ^{6*}	119,000	63,790	31,460	91	-20	29,100	18,800	31
06214500	Yellowstone River at Billings, Montana.....	11,795	7,056	2,310	92	2	2,090	1,350	31
06934500	Missouri River at Hermann, Missouri ^{6*}	524,200	80,880	50,590	152	63	48,600	31,400	31
07289000	Mississippi River at Vicksburg, Mississippi ^{5*}	1,140,500	584,000	1,513,000	234	145	1,380,000	893,000	29
07331000	Washita River near Dickson, Oklahoma.....	7,202	1,402	1,804	510	178	941	608	31
08276500	Rio Grande below Taos Junction Bridge, near Taos, New Mexico.	9,730	742	507	122	9	480	310	31
09315000	Green River at Green River, Utah.....	44,850	6,391	1,744	69	21	.....	.....	...
11425500	Sacramento River at Verona, California.....	21,251	19,430	9,237	33	-13	.....	.....	...
13269000	Snake River at Weiser, Idaho.....	69,200	18,520	11,000	67	3	5,770	3,730	31
13317000	Salmon River at White Bird, Idaho.....	13,550	11,390	3,560	83	11	2,790	1,800	31
13342500	Clearwater River at Spalding, Idaho.....	9,570	15,510	7,380	103	13	4,850	3,130	31
14105700	Columbia River at The Dalles, Oregon ^{6*}	237,000	1193,500	188,890	103	-11	203,000	131,000	31
14191000	Willamette River at Salem, Oregon.....	7,280	123,690	131,460	55	13	11,600	7,500	31
15515500	Tanana River at Nenana, Alaska.....	25,600	23,810	7,000	108	-12	6,800	4,390	31
08MP005	Fraser River at Hope, British Columbia.....	83,800	96,250	31,500	89	-27	29,100	18,800	31

¹Adjusted.²Records furnished by Corps of Engineers.³Records furnished by Tennessee Valley Authority.⁴Records furnished by Buffalo District, Corps of Engineers, through International St. Lawrence River Board of Control. Discharges shown are considered to be the same as discharge at Ogdensburg, N.Y., when adjusted for storage in Lake St. Lawrence.⁵Records of daily discharge computed jointly by Corps of Engineers and Geological Survey.⁶Discharge determined from information furnished by Bureau of Reclamation, Corps of Engineers, and Geological Survey.

*Indicates stations excluded from the combination bar/line graph. See Explanation of Data.

USABLE CONTENTS OF SELECTED RESERVOIRS AND RESERVOIR SYSTEMS



USABLE CONTENTS OF SELECTED RESERVOIRS NEAR END OF JANUARY 1991

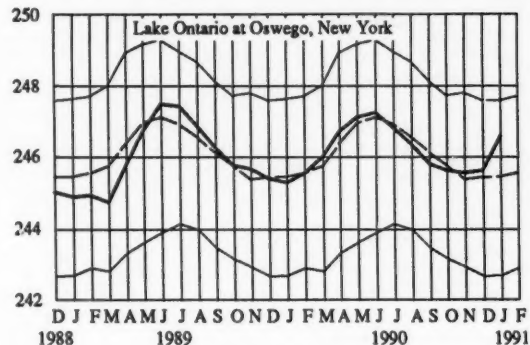
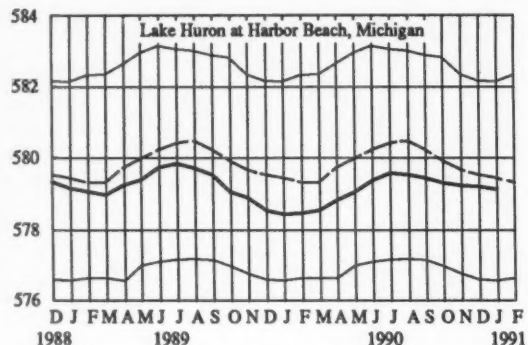
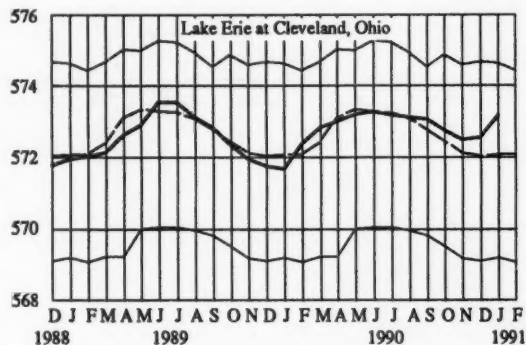
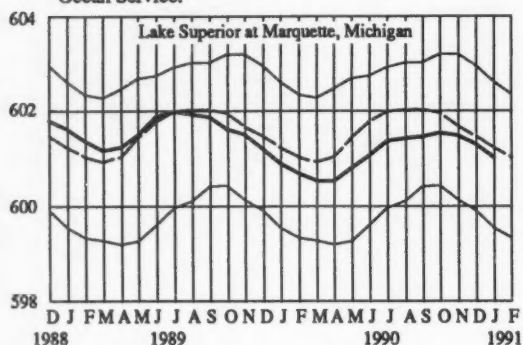
(Contents are expressed in percent of reservoir (system) capacity. The usable storage capacity of each reservoir (system) is shown in the column headed "Normal maximum")

Reservoir						Reservoir					
Principal use: F-Flood control I-Irrigation M-Municipal P-Power R-Recreation W-Industrial						Principal use: F-Flood control I-Irrigation M-Municipal P-Power R-Recreation W-Industrial					
Percent of normal maximum						Percent of normal maximum					
End of January 1991	End of January 1990	Average for end of January	End of December 1990	Normal maximum (acre-feet) ¹		End of January 1991	End of January 1990	Average for end of January	End of December 1990	Normal maximum (acre-feet) ¹	
NOVA SCOTIA											
Rosignol, Mulgrave, Falls Lake, St. Margaret's Bay, Black, and Foxbrook Reservoirs (P).....						56	46	57	62	2,226,300	
QUEBEC											
Allard (P).....						26	52	46	32	280,600	
Gouin (P).....						78	50	59	86	6,954,000	
MAINE											
Seven Reservoir Systems (MP).....						71	49	49	84	4,107,000	
NEW HAMPSHIRE											
First Connecticut Lake (P).....						47	47	36	77	76,450	
Lake Francis (FPR).....						74	52	51	93	99,310	
Lake Winnepesaukee (PR).....						67	59	57	88	165,700	
VERMONT											
Harrison (P).....						56	58	47	77	116,200	
Somerset (P).....						71	69	59	79	57,390	
MASSACHUSETTS											
Cobble Mountain and Borden Brook (MP).....						89	86	71	91	77,920	
NEW YORK											
Great Sacandaga Lake (FPR).....						71	54	44	80	786,700	
Indian Lake (FMP).....						66	70	54	78	103,300	
New York City Reservoir System (MW).....						93	89	82	92	1,680,000	
NEW JERSEY											
Wanaque (M).....						94	89	75	90	85,100	
PENNSYLVANIA											
Allegheny (FPR).....						32	32	29	39	1,180,000	
Pymatuning (FMR).....						94	88	83	91	188,000	
Raystown Lake (FR).....						67	67	58	67	761,900	
Lake Wallenpaupack (FR).....						58	66	53	72	157,800	
MARYLAND											
Baltimore Municipal System (M).....						98	89	85	94	261,900	
NORTH CAROLINA											
Bridgewater (Lake James) (P).....						93	87	79	95	288,800	
Narrows (Baldin Lake) (P).....						92	95	95	94	128,900	
High Rock Lake (P).....						76	92	63	80	234,800	
SOUTH CAROLINA											
Lake Murray (P).....						82	90	67	66	1,614,000	
Lakes Marion and Moultrie (P).....						69	72	69	61	1,862,000	
SOUTH CAROLINA-GEORGIA											
Strom Thurmond Lake (FP).....						69	76	59	55	1,730,000	
GEORGIA											
Burton (FR).....						81	80	58	83	104,000	
Sinclair (MPR).....						100	96	83	86	214,000	
Lake Sidney Lanier (FMPR).....						47	67	52	42	1,886,000	
ALABAMA											
Lake Martin (P).....						75	94	68	73	1,375,000	
TENNESSEE VALLEY											
Clinch Projects: Norris and Melton Hill Lakes (FPR).....						43	44	35	52	2,293,000	
Douglas Lake (FPR).....						15	20	14	20	1,395,000	
Hiwassee Projects: Chatuga, Nottely, Hiwassee, Apalachia, Blue Ridge, Ocoee 3, and Parkville Lakes (FPR).....						50	56	42	54	1,012,000	
Holston Projects: South Holston, Watauga, Boone, Fort Patrick Henry, and Cherokee Lakes (FPR).....						48	52	34	52	2,880,000	
Little Tennessee Projects: Nantahala, Thorpe, Fontana, and Chilhowee Lakes (FPR).....						80	22	40	41	1,478,000	
WISCONSIN											
Chippewa and Flambeau (FR).....						77	74	45	81	365,000	
Wisconsin River (21 Reservoirs) (FR).....						57	33	35	78	399,000	
MINNESOTA											
Mississippi River Headwater System (FMR).....						29	28	21	28	1,640,000	
NORTH DAKOTA											
Lake Sakakawea (Garrison) (FPR).....						56	58	79	60	22,700,000	
SOUTH DAKOTA											
Angostura (I).....						43	43	70	42	130,770	
Belle Fourche (I).....						27	32	48	24	185,200	
Lake Francis Case (FIP).....						66	65	68	57	4,589,000	
Lake Oahe (FIP).....						56	61	66	55	22,240,000	
Lake Sharpe (FIP).....						100	100	99	103	1,697,000	
Lewis and Clark Lake (FIP).....						99	100	102	95	432,000	
NEBRASKA											
Lake McConaughy (IP).....						54	66	72	52	1,948,000	
OKLAHOMA											
Bufala (FPR).....						97	101	86	96	2,378,000	
Keystone (FPR).....						84	84	86	81	661,000	
Tenkiller Ferry (FPR).....						104	110	92	103	628,200	
Lake Afton (FIMR).....						65	82	50	58	133,000	
Lake O'The Cherokee (FPR).....						96	99	80	92	1,492,000	
OKLAHOMA-TEXAS											
Lake Texoma (FMPRW).....						96	94	88	95	2,722,000	
TEXAS											
Bridgeport (IMW).....						87	89	48	85	386,400	
Canyon (FMR).....						94	85	81	94	385,600	
International Amistad (FIMPW).....						94	78	85	94	3,497,000	
International Falcon (FIMPW).....						66	44	73	78	2,668,000	
Livingston (IMW).....						99	104	89	101	1,788,000	
Pocumuck Kingdom (IMPRW).....						93	86	93	91	570,200	
Red Bluff (P).....						23	31	31	22	307,000	
Toledo Bend (P).....						102	97	85	87	4,472,000	
Twin Buttes (FIMW).....						52	48	35	49	177,800	
Lake Kemp (IMW).....						95	95	85	91	268,000	
Lake Meredith (FMW).....						32	39	37	32	796,900	
Lake Travis (FMPRW).....						96	64	80	91	1,144,000	
MONTANA											
Canyon Ferry (FIMPR).....						71	72	79	77	2,043,000	
Fort Peck (FPR).....						55	59	81	56	18,910,000	
Hungry Horse (FPR).....						70	75	67	82	3,451,000	
WASHINGTON											
Ross (PR).....						63	63	54	83	1,052,000	
Franklin D. Roosevelt Lake (IP).....						89	96	82	87	5,022,000	
Lake Cleelan (FR).....						74	56	44	88	676,100	
Lake Cushman (FR).....						68	22	78	56	359,500	
Lake Merwin (P).....						100	98	96	97	245,600	
IDAHO											
Boise River (4 Reservoirs) (FIP).....						39	45	58	36	1,235,000	
Coeur d'Alene Lake (P).....						57	57	48	48	238,500	
Pend Oreille Lake (P).....						37	31	51	37	1,561,000	
IDAHO-WYOMING											
Upper Snake River (8 Reservoirs) (MP).....						50	66	64	46	4,401,000	
WYOMING											
Boysen (FIP).....						73	73	70	73	802,000	
Buffalo Bill (IP).....						40	53	63	38	421,300	
Keyhole (P).....						15	20	41	15	193,800	
Pathfinder, Seminole, Alcova, Kortes, Glendo, and Guernsey Reservoirs (I).....						33	37	50	32	3,056,000	
COLORADO											
John Martin (FIR).....						12	14	21	9	364,400	
Taylor Park (IR).....						71	67	56	73	106,200	
Colorado-Big Thompson Project (I).....						48	36	57	47	730,300	
COLORADO RIVER STORAGE PROJECT											
Lake Powell: Flaming Gorge, Fontenelle, Navajo, and Blue Mesa Reservoirs (FPR).....						65	73	71	66	31,620,000	
UTAH-IDAHO											
Bear Lake (FIPR).....						34	51	58	33	1,421,000	
CALIFORNIA											
Folsom (FIP).....						15	34	33	15	1,000,000	
Hetch Hetchy (MP).....						10	33	33	19	360,400	
Imperial (FIP).....						8	15	27	8	568,100	
Pine Flat (FIP).....						4	7	49	4	1,001,000	
Clear Lake (Lawiston) (P).....						30	53	74	39	2,438,000	
Lake Almanor (P).....						66	69	52	65	1,036,000	
Lake Berryessa (FIMW).....						36	50	81	37	1,600,000	
Millerton Lake (FI).....						37	35	63	34	503,200	
Shasta Lake (FIPR).....						36	52	70	37	4,377,000	
CALIFORNIA-NEVADA											
Lake Tahoe (IPR).....						0	0	49	0	744,600	
NEVADA											
Rye Patch (I).....						1	6	52	0	194,300	
ARIZONA-NEVADA											
Lake Mead and Lake Mohave (FIMP).....						77	83	71	76	27,970,000	
ARIZONA											
San Carlos (IP).....						18	6	26	6	935,100	
Salt and Verde River System (IMPR).....						48	49	45	39	2,019,100	
NEW MEXICO											
Conchas (FIR).....						60	66	78	59	315,700	
Elephant Butte and Caballo (FIPR).....						65	74	44	63	2,394,000	

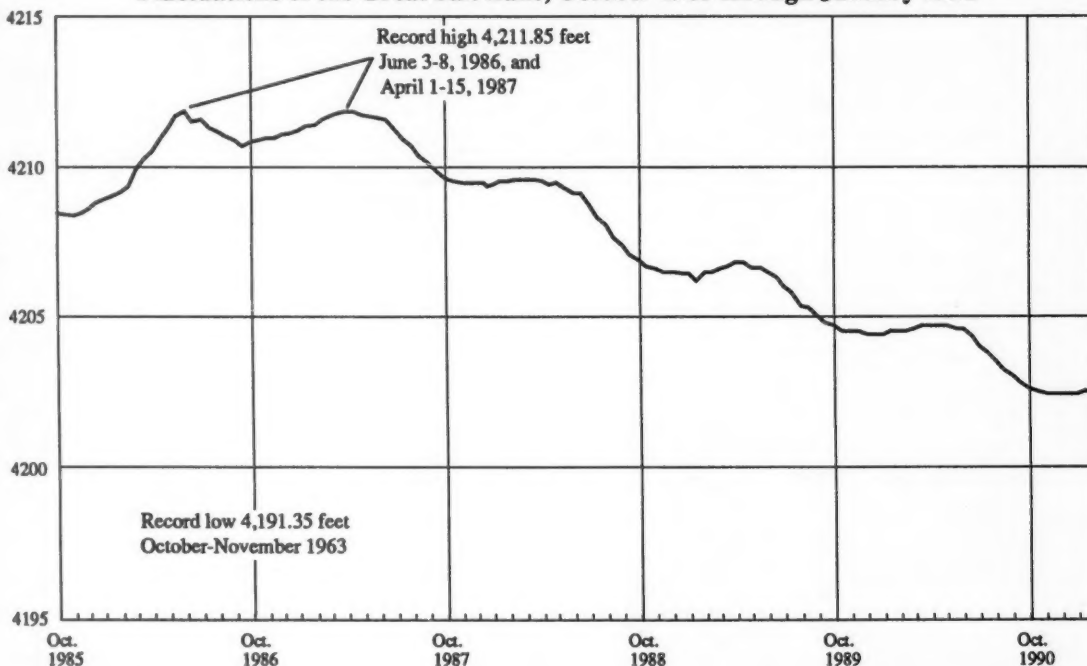
¹ 1 acre-foot = 0.04356 million cubic feet = 0.326 million gallons = 0.504 cubic feet per second per day.² Thousands of kilowatt-hours (the potential electric power that could be generated by the volume of water in storage).

GREAT LAKES ELEVATIONS

Area between light-weight solid lines indicates range between highest and lowest record for the month. Dashed line indicates median of monthly values for reference period, 1951-80. Heavy line indicates mean for current period. Data from National Ocean Service.

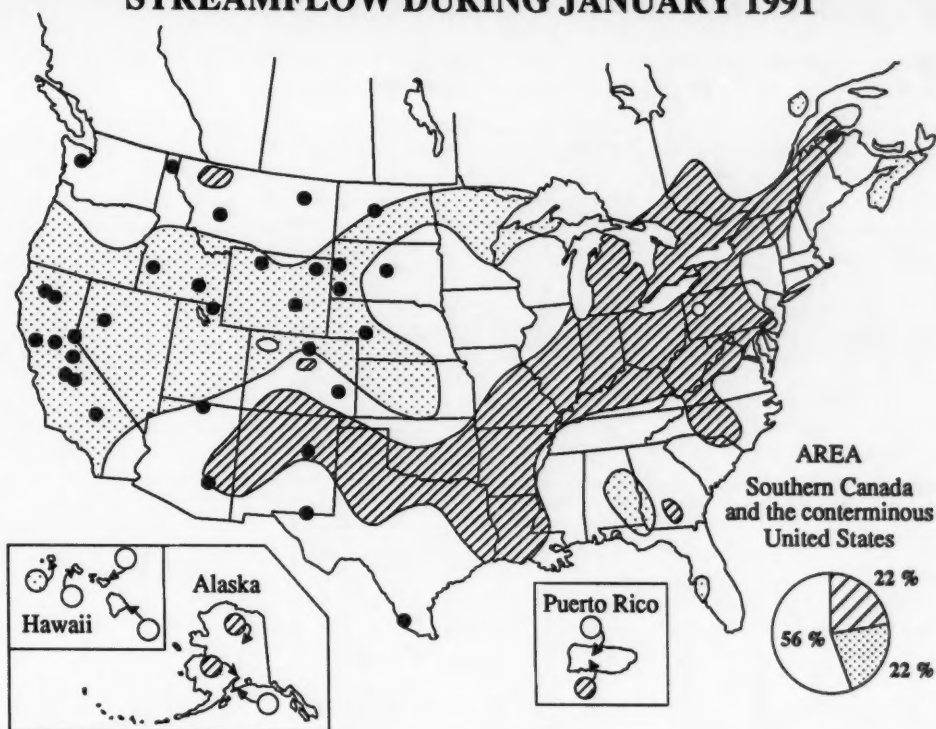


Fluctuations of the Great Salt Lake, October 1985 through January 1991

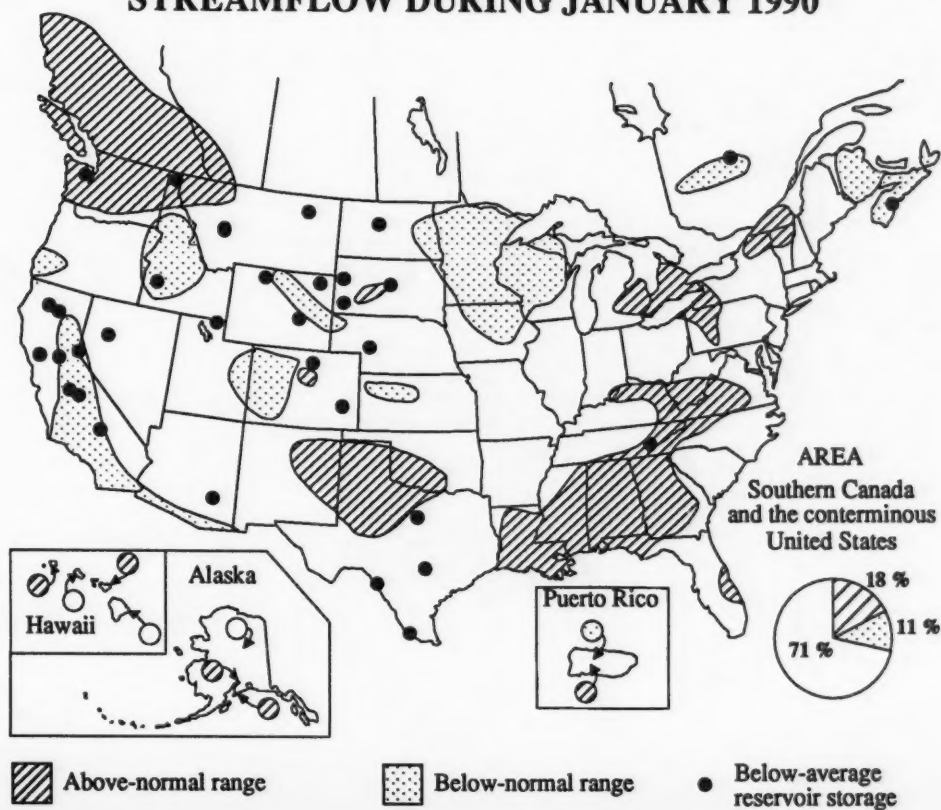


ELEVATION, IN FEET ABOVE NATIONAL GEODETIC VERTICAL DATUM OF 1929

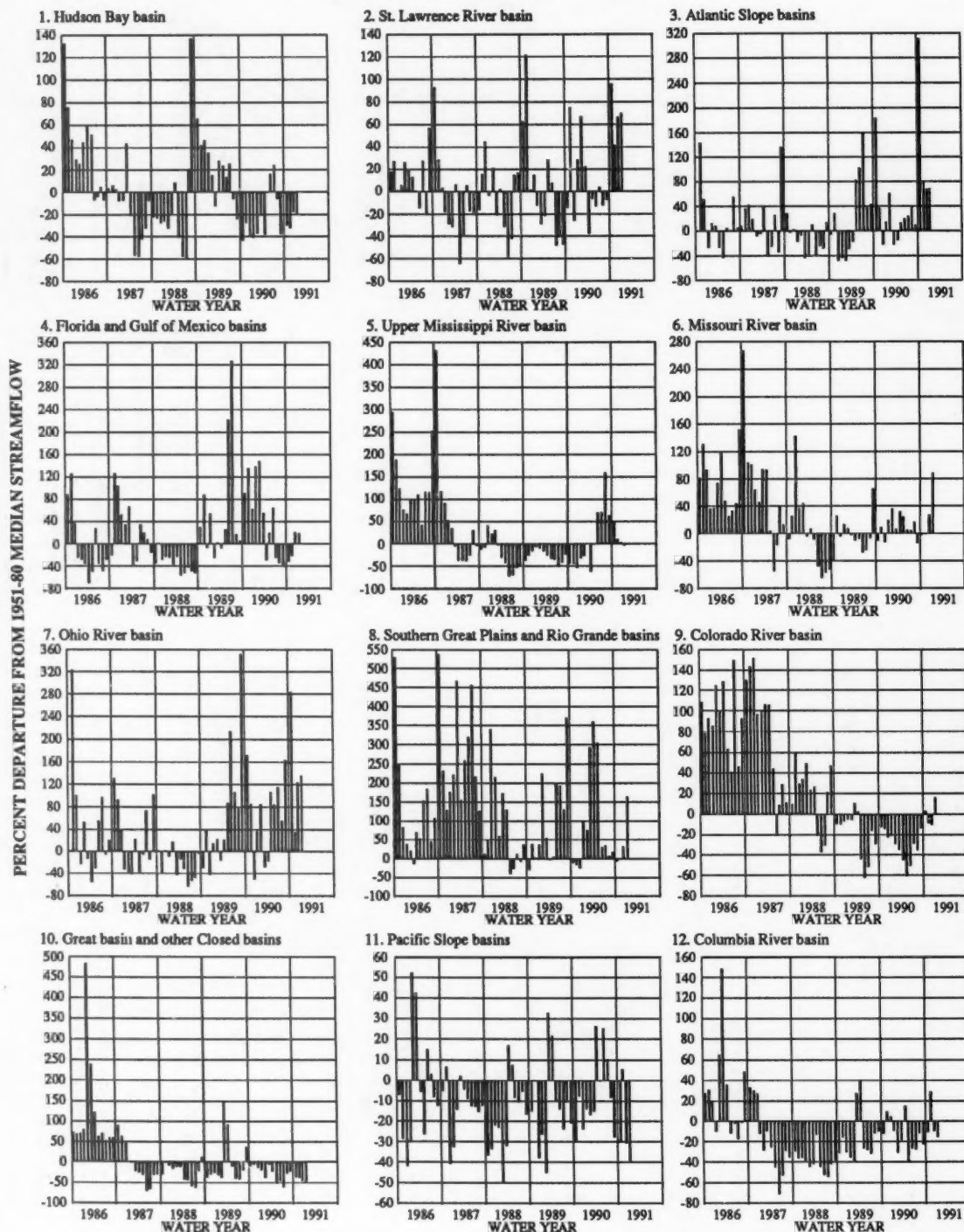
STREAMFLOW DURING JANUARY 1991



STREAMFLOW DURING JANUARY 1990



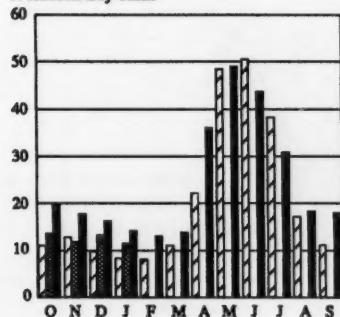
MONTHLY DEPARTURE OF ACTUAL STREAMFLOW (OCTOBER 1985-JANUARY 1991) FROM MEDIAN STREAMFLOW (1951-80)



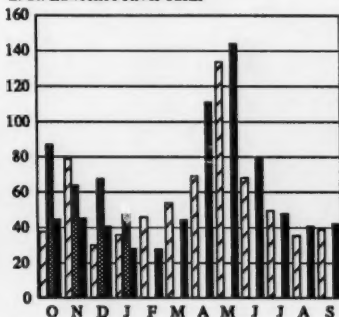
ACTUAL MONTHLY STREAMFLOW, 1990 AND 1991 WATER YEARS, COMPARED WITH MEDIAN MONTHLY STREAMFLOW, 1951-80

MONTHLY MEAN DISCHARGE, THOUSANDS OF CUBIC FEET PER SECOND

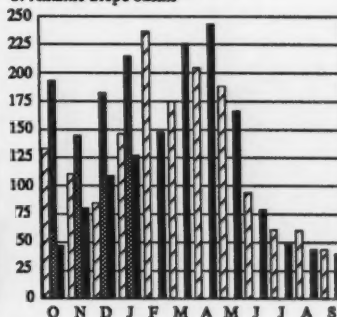
1. Hudson Bay basin



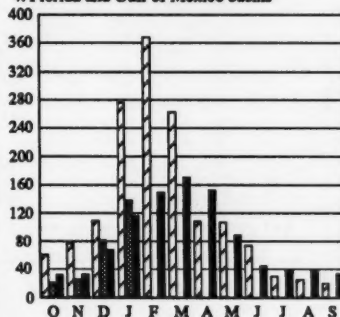
2. St. Lawrence River basin



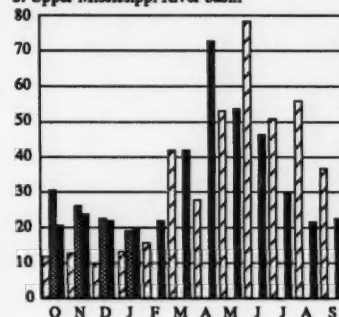
3. Atlantic Slope basins



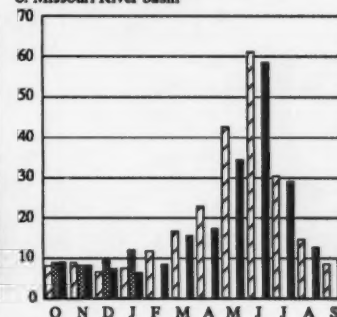
4. Florida and Gulf of Mexico basins



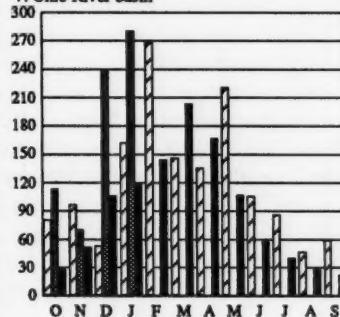
5. Upper Mississippi River basin



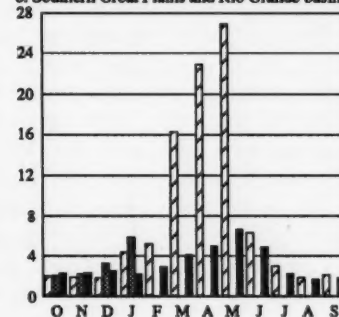
6. Missouri River basin



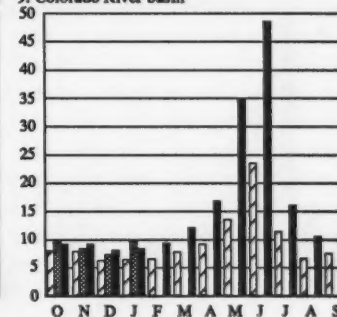
7. Ohio River basin



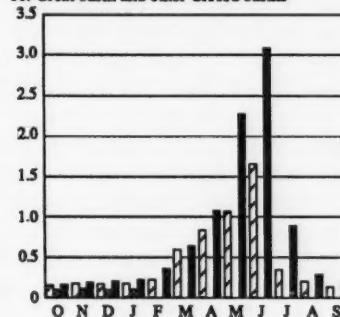
8. Southern Great Plains and Rio Grande basins



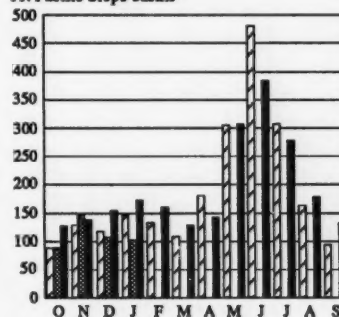
9. Colorado River basin



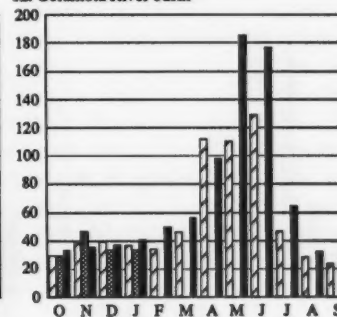
10. Great basin and other Closed basins



11. Pacific Slope basins



12. Columbia River basin

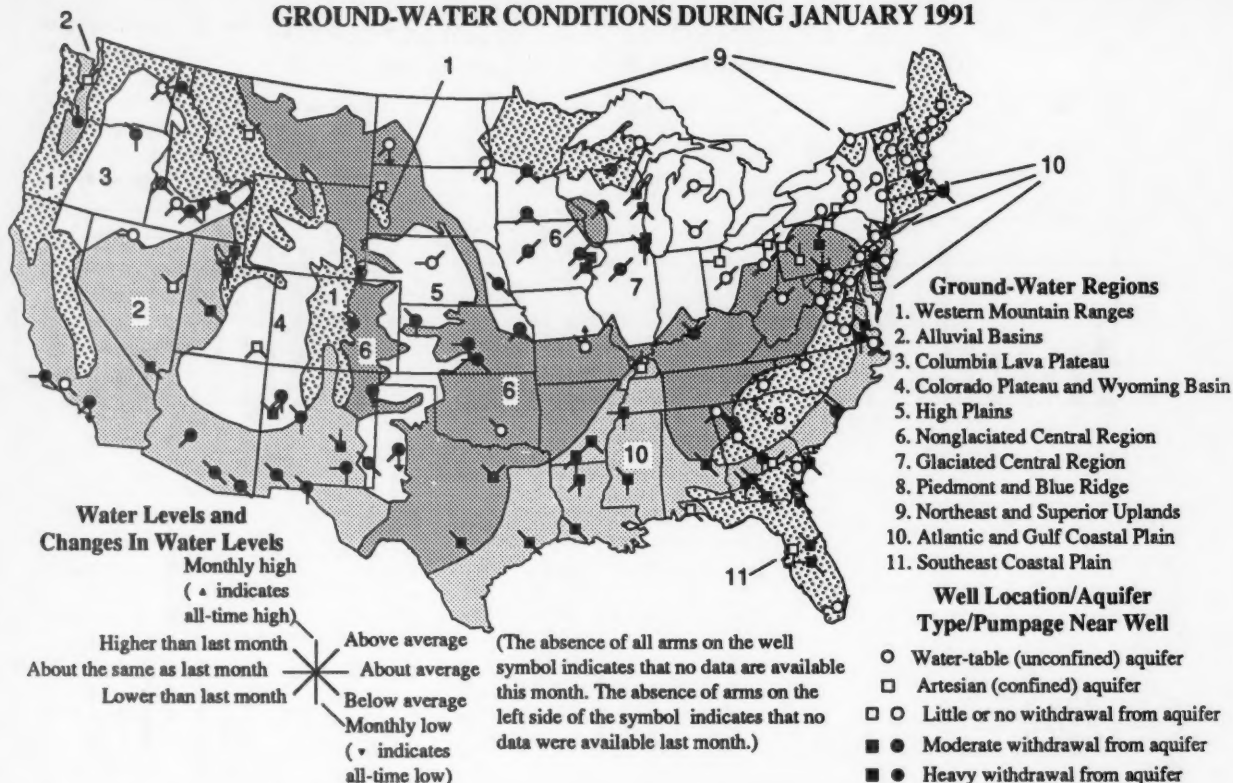


□ 1990 Water Year

■ 1991 Water Year

▨ 1951-80 Median

GROUND-WATER CONDITIONS DURING JANUARY 1991



Ground-water levels in the Western Mountain Ranges were mixed with respect to last month and also with respect to long-term averages.

In the Alluvial Basins, levels rose above last month's levels except in Washington, California, and parts of Utah and Arizona where they fell. Nevertheless, levels remained below average in most of the Region except for Washington and Oregon and parts of Nevada and New Mexico where they were above average. January lows occurred in wells in Utah (see graph on page 19), New Mexico and Texas (see graph on page 19), while monthly highs occurred in wells in Oregon and New Mexico. (See new extremes table on page 18 for data on these and other wells with new extremes.) An all-time low level occurred in the alluvial sand and gravel aquifer at Baldwin Park, California.

Water levels in the Columbia Lava Plateau were down from last month except in Oregon, and remained below long-term averages throughout the Region. A January low occurred in a well in Idaho and despite a rise in level since last month, in a well in Oregon.

In the Colorado Plateau and Wyoming Basin, levels were mixed with respect to last month and with respect to long-term averages. A January low occurred in a well in New Mexico.

In the High Plains Region, water levels were mixed with respect to last month's. Levels remained below long-term averages, except in Nebraska where they were above average.

Despite a rise in level since last month, a January low occurred in a well in Kansas. A monthly low also occurred in a well in New Mexico. An all-time low occurred in the Ogallala aquifer well near Lubbock, Texas.

Water levels in the Non-glaciaded Central Region fell from last month's levels in the Dakotas and Georgia, but rose in most other parts of the Region. Levels were below long-term averages in the Dakotas, Kansas, Georgia, and part of Texas, and above average elsewhere. January lows occurred in wells in South Dakota and Kansas and a monthly high occurred in a well in Pennsylvania. An all-time low occurred in the Sentinel Butte aquifer well near Dickinson, North Dakota, and an all-time high occurred in the Ozark aquifer well near Rolla, Missouri.

In the Glaciaded Central Region, levels were below last month's in North Dakota, Minnesota, Kansas, Wisconsin, Pennsylvania, and most of Iowa; above last month's levels in Nebraska and New Jersey; and mixed with respect to last month's levels elsewhere. Water levels were below long-term averages in North Dakota, Minnesota, Nebraska, and Kansas; mixed with respect to average in Iowa, Wisconsin, and Illinois; and above average elsewhere. January lows occurred in wells in Iowa and Illinois and highs occurred in wells in Ohio (see graph on page 19). An all-time low occurred in the Sheyenne Delta aquifer near Wyndmere, North Dakota.

Levels were above last month's in the Piedmont and Blue Ridge and above long-term averages except in Georgia. Water

WATER LEVELS IN KEY OBSERVATION WELLS IN SOME REPRESENTATIVE AQUIFERS IN THE CONTERMINOUS UNITED STATES—JANUARY 1991

GROUND-WATER REGION Aquifer and Location	Aquifer type and local aquifer pumpage	Depth of well in feet	Water level in feet below land- surface datum	Departure from average in feet	Net change in water level in feet since:		Year records began	Remarks
					Last month	Last year		
WESTERN MOUNTAIN RANGES (1)								
Rathdrum Prairie aquifer near Athol, northern Idaho	●	485	462.3	-1.0	-0.1	.....	1929	
ALLUVIAL BASINS (2)								
Alluvial valley fill aquifer in Steptoe Valley, Nevada	□	122	7.90	4.20	.38	-0.73	1949	
Alluvial sand and gravel aquifer, Baldwin Park, California	●	200	187.38	-67.13	-.81	-8.99	1932	All-time low
Valley fill aquifer, Elfrida area near Douglas, Arizona	●	124	100.52	-18.60	.34	-1.35	1947	
Huaco bolson aquifer at El Paso, Texas	●	640	270.46	-20.65	.44	-.63	1964	Jan. low
COLUMBIA LAVA PLATEAU (3)								
Snake River Plain aquifer near Eden, Idaho	●	208	126.6	-7.0	-2.8	-1.3	1962	
Columbia River basalt aquifer, Pendleton, Oregon	●	1,501	218.05	-27.03	.50	-3.25	1965	Jan. low
COLORADO PLATEAU AND WYOMING BASIN (4)								
Dakota aquifer near Blanding, Utah	□	140	47.33	-.85	-.95	-5.49	1960	
HIGH PLAINS (5)								
Wind-blown sand deposits of the High Plains aquifer system near Dunning, Nebraska	○	13	3.60	.15	.08	.08	1934	
Southern High Plains aquifer, Lovington, New Mexico	●	212	59.67	-5.80	.16	.05	1971	
NON-GLACIATED CENTRAL REGION (6)								
Sentinel Butte aquifer near Dickinson, North Dakota	○	160	21.19	-2.71	-.07	-1.00	1968	All-time low
Sand and gravel Pleistocene aquifer near Valley Center, Kansas	●	54	20.20	-2.61	-.10	-.80	1937	
Glacial outwash sand and gravel aquifer near Louisville, Kentucky	●	94	17.75	7.08	.26	1.43	1945	
Upper Pennsylvanian aquifer in the Central Appalachians Plateau near Glenview, West Virginia	○	25	15.25	1.04	.22	-.57	1953	
GLACIATED CENTRAL REGION (7)								
Fluvial sand and gravel aquifer, Platte River Valley, near Ashland, Nebraska	●	12	7.32	-1.44	.24	-.61	1933	
Sheyenne Delta aquifer near Wyndmere, North Dakota	○	40	8.96	-2.21	-.16	-.37	1963	All-time low
Pleistocene (glacial drift) aquifer at Princeton in northern Illinois	●	29	6.35	5.46	-.33	1.03	1942	
Shallow drift aquifer near Roscommon in north-central part of Lower Peninsula, Michigan	○	14	4.80	.10	-.28	.95	1934	
Silurian-Devonian carbonate aquifer near Dola, Ohio	□	51	6.17	2.40	-.03	1.83	1954	Jan. high
PIEDMONT AND BLUE RIDGE (8)								
Water-table aquifer in Petersburg Granite, southeastern Piedmont, Colonial Heights, Virginia	○	100	13.79	1.39	2.52	.25	1939	
Weathered granite aquifer, western Piedmont, Mocksville area, North Carolina	○	31	14.40	5.51	1.22	1.39	1981	Jan. high
Surficial aquifer at Griffin, Georgia	○	30	19.43	-3.94	1.96	-4.97	1943	
NORTHEAST AND SUPERIOR UPLANDS (9)								
Pleistocene glacial outwash aquifer, at Camp Ripley, near Little Falls, Minnesota	●	59	15.33	-2.0	-.48	.44	1949	
Glacial till aquifer at Augusta, Maine	○	22	6.22	.49	-2.18	-.57	1960	
Shallow sand aquifer (glacial deposits), Acton, Massachusetts	●	34	18.49	.77	.39	.64	1965	
Pleistocene sand aquifer near Morrisville, Vermont	○	50	17.94	.82	-.50	.91	1966	
ATLANTIC AND GULF COASTAL PLAIN (10)								
Columbia deposits aquifer near Camden, Delaware	□	11	6.62	.24	1.67	-1.20	1950	
Memphis sand aquifer near Memphis, Tennessee	■	384	107.54	-16.80	.08	-.76	1940	Jan. low
Butaw aquifer in the City of Montgomery, Alabama	■	270	25.3	-4.2	1.2	-4.8	1952	
Evangeline aquifer at Houston, Texas	■	1,152	307.72	-8.73	4.17	-11.53	1978	
SOUTHEAST COASTAL PLAIN (11)								
Upper Floridan aquifer on Cockspear Island, Savannah area, Georgia	■	348	32.91	-5.71	4.35	1.32	1956	
Upper Floridan aquifer, Jacksonville, Florida	■	905	-20.4	-8.5	.6	-.4	1930	
Biscayne aquifer near Homestead, Florida	○	20	7.98	.78	.05	.05	1932	

level rose to a January high in a well in North Carolina.

In the Northeast and Superior Uplands, levels fell in Minnesota, Michigan, Maine and Vermont, and rose elsewhere with respect to last month. Levels were below long-term averages in Minnesota and Michigan, and above average elsewhere. January highs occurred in wells in Maine and New Hampshire.

In the Atlantic and Gulf Coastal Plain, levels declined from last month or remained the same in Massachusetts, Florida, Tennessee, Arkansas, and part of Louisiana, and rose elsewhere. Water levels were above long-term averages in Delaware and Kentucky; mixed in New Jersey and Georgia; and below average elsewhere. January lows occurred in wells in

NEW EXTREMES DURING JANUARY 1991 AT GROUND-WATER INDEX STATIONS

WRD Station Identification Number	Aquifer and Location	Aquifer type and local aquifer pumpage	Depth of well	Years of record	End-of-month water level in feet below land surface datum		
					Previous January Record		
					Average	Extreme (year)	January 1991
LOW WATER LEVELS							
ALLUVIAL BASINS							
315212106245101	Huaco bolson aquifer at El Paso, Texas	●	640	26	249.81	269.83 (1990)	270.46
324340104231701	Roswell Basin shallow aquifer at Dayton, New Mexico	●	250	39	91.15	122.58 (1987)	122.72
340535117573501	Alluvial sand and gravel aquifer at Baldwin Park, California	●	200	58	120.25	182.1 (1978)	187.38
351051106395301	Basin fill aquifer at Albuquerque, New Mexico	●	980	7	30.93	34.54 (1986)	34.95
403803111505301	Basin fill aquifer near Holladay, Utah	■	165	12	61.25	75.41 (1990)	77.65
414501111520001	Basin fill aquifer near Logan, Utah	■	43	50	-18.00	-13.3 (1989)	-12.6
COLUMBIA LAVA PLATEAU							
424053113412801	Snake River Plain aquifer near Rupert, Idaho	●	194	40	150.4	157.1 (1982)	159.0
453934118491701	Columbia River basalts aquifer at Pendleton, Oregon	●	1,501	25	191.02	214.80 (1990)	218.05
COLORADO PLATEAU AND WYOMING BASIN							
352023107473201	Westwater Canyon aquifer near Grants-Bluewater, New Mexico	●	155	35	70.13	71.65 (1982)	78.10
HIGH PLAINS							
341010102240801	Ogallala aquifer near Lubbock, Texas	●	202	40	57.39	88.92 (1989)	190.98
361847103064701	Ogallala aquifer at Clayton, New Mexico	●	231	22	86.81	91.13 (1985)	95.35
392329101040201	Ogallala aquifer near Colby, Kansas	●	175	43	118.43	128.45 (1990)	129.54
NON-GLACIATED CENTRAL REGION							
375810097324301	Equus aquifer near Halstead, Kansas	●	57	51	22.33	33.05 (1990)	36.05
441759103261201	Minnelusa aquifer near Tifford, South Dakota	□	302	5	25.99	45.41 (1990)	55.43
465755102410701	Sentinel Butte aquifer near Dickinson, North Dakota	○	160	22	18.48	20.19 (1990)	21.19
GLACIATED CENTRAL REGION							
415534091251502	Cambrian-Ordovician aquifer at Mt. Vernon, Iowa	■	1,557	3	336.44	337.93 (1990)	338.68
422803087475302	Lower Mount Simon aquifer at Illinois Beach State Park, Illinois	■	2,264	2	200.01	201.56 (1990)	204.46
462633097163402	Sheyenne Delta aquifer near Wyndmere, North Dakota	○	40	27	6.75	8.64 (1977)	18.96
ATLANTIC AND GULF COASTAL PLAIN							
321945090152201	Sparta aquifer system at Jackson, Mississippi	■	852	46	248.10	305.39 (1990)	307.59
322357092341701	Sparta aquifer near Ruston, Louisiana	■	703	16	222.78	235.04 (1990)	236.92
323302083263401	Dublin aquifer system at Tarverville, Georgia	■	616	15	163.81	165.32 (1989)	165.33
335115079033500	Pee Dee aquifer at Collins Park at Conway, South Carolina	■	438	16	33.82	59.84 (1990)	61.80
350900089482300	Memphis sand aquifer near Memphis, Tennessee	■	384	50	90.74	106.78 (1990)	107.54
364059076544901	Middle Potomac aquifer at Franklin, Virginia	■	305	30	167.91	203.12 (1988)	208.97
372506076511703	Upper Potomac aquifer near Toano, Virginia	●	401	5	158.40	160.95 (1990)	162.11
SOUTHEAST COASTAL PLAIN							
281715082164401	Upper Floridan aquifer near San Antonio, Florida	□	150	26	39.56	45.09 (1981)	49.03
313553084203202	Claiborne aquifer near Albany, Georgia	■	251	12	20.98	26.06 (1989)	27.17
HIGH WATER LEVELS							
ALLUVIAL BASINS							
332615104303601	Roswell Basin artesian aquifer at Roswell, New Mexico	■	324	24	53.18	40.03 (1990)	38.40
452938122254801	Troutdale aquifer near Portland, Oregon	●	715	27	102.48	90.32 (1989)	88.65
NON-GLACIATED CENTRAL REGION							
375749091475001	Ozark aquifer near Rolla, Missouri	○	450	1	...	4.96 (1990)	243.80
393638078001301	Romney aquifer at Fort Frederick State Park near Big Pool, Maryland	○	42	41	32.01	24.44 (1951)	22.01
394731077411701	Carbonate aquifer near Greencastle, Pennsylvania	■	296	15	28.08	25.12 (1978)	20.98
402138079031802	Shale aquifer at State Game Land 42, Pennsylvania	□	110	23	17.33	15.66 (1990)	14.11
404140077354801	Carbonate aquifer at Roseann, Pennsylvania	■	200	7	56.84	51.47 (1987)	42.96
GLACIATED CENTRAL REGION							
403207081293800	Glacial drift aquifer near Dover, Ohio	○	62	30	8.98	6.12 (1978)	5.90
404648083412600	Silurian-Devonian carbonate aquifer near Dola, Ohio	□	57	36	8.57	6.30 (1978)	6.17
PIEDMONT AND BLUE RIDGE							
355359080331701	Weathered granite aquifer near Mocksville, North Carolina	○	31	9	19.91	15.79 (1990)	14.40
NORTHEAST AND SUPERIOR UPLANDS							
431540071452801	Stratified drift aquifer at Warner, New Hampshire	○	43	25	33.13	29.66 (1974)	29.47
445319068560101	Bedrock aquifer near Kenduskeag, Maine	□	98	12	22.34	20.92 (1984)	20.86
ATLANTIC AND GULF COASTAL PLAIN							
365210088391301	Claiborne aquifer near Viola, Kentucky	□	106	39	14.69	10.96 (1989)	9.85

¹ All-time month-end low.² All-time month-end high.

Virginia, South Carolina, Georgia, Mississippi, Tennessee, Arkansas and Louisiana. Level rose to a January high in the well in Kentucky.

Water levels were at or above last month's levels in most of

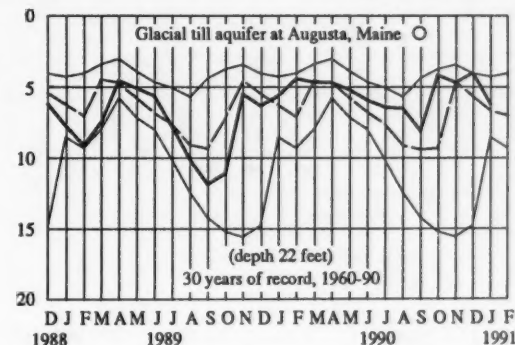
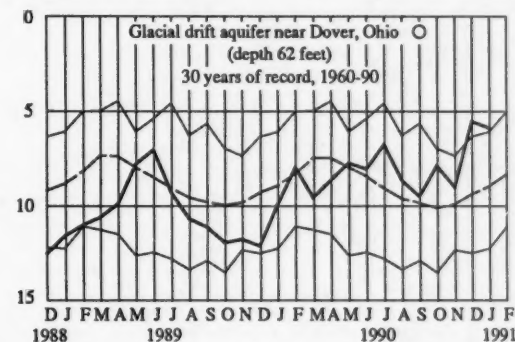
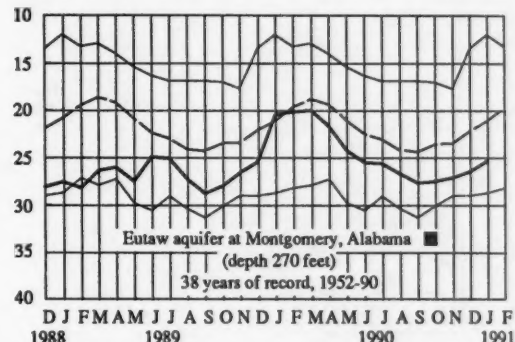
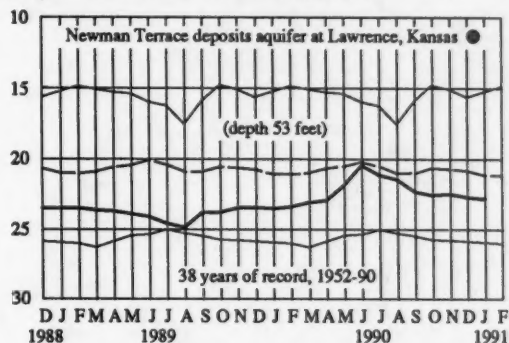
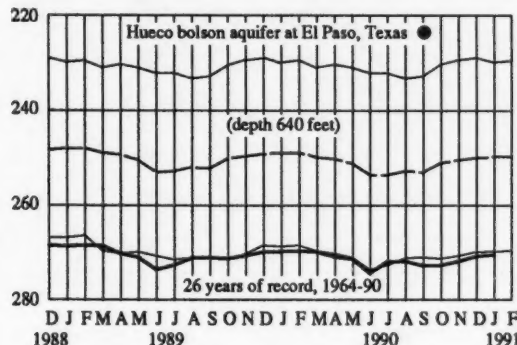
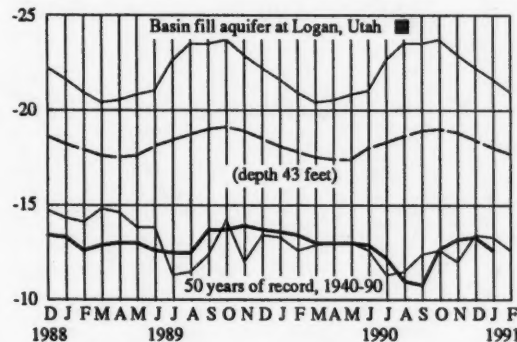
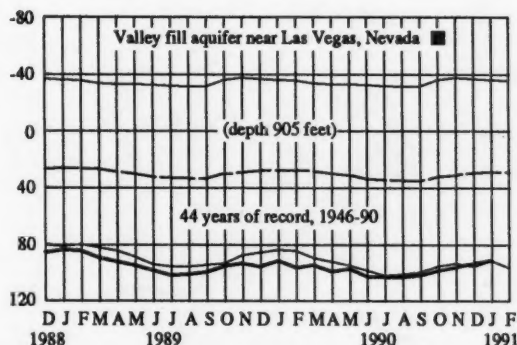
the Southeastern Coastal Plain and were generally below long-term averages in Georgia and mixed with respect to average in Florida. January lows occurred in one well in Georgia and one well in Florida.

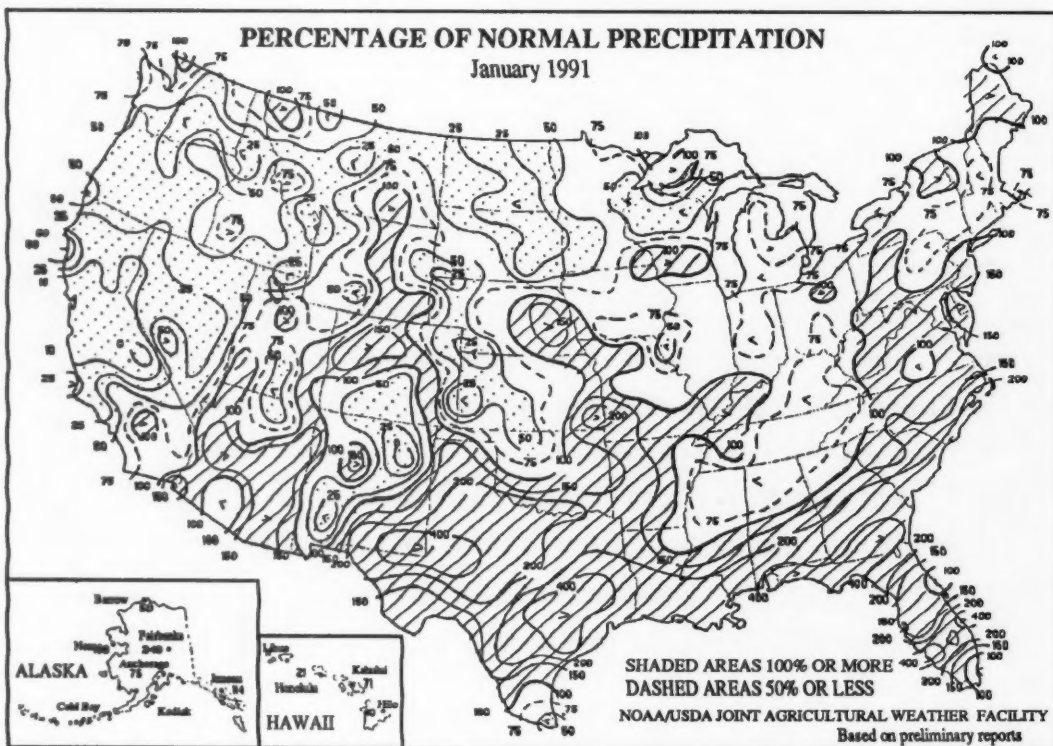
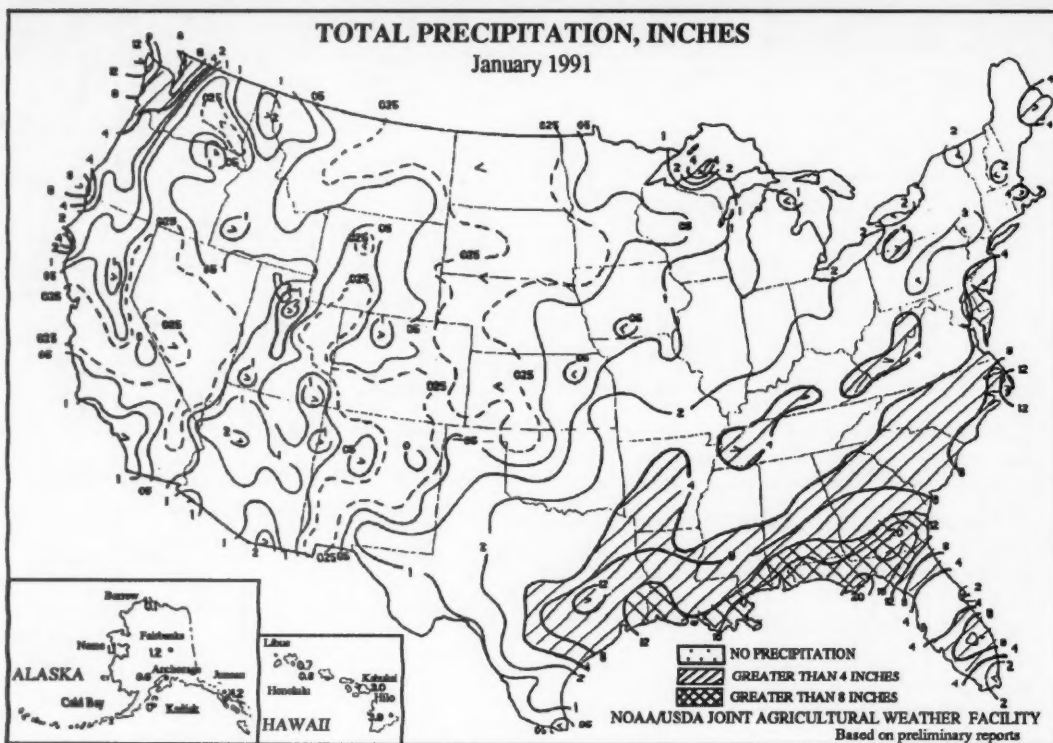
MONTHEND GROUND-WATER LEVELS IN SELECTED WELLS

Area between light-weight solid lines indicates range between highest and lowest record for the month. Dashed line indicates average of monthly levels in previous years. Heavy line indicates level for current period.



WATER LEVEL, FEET BELOW LAND-SURFACE DATUM



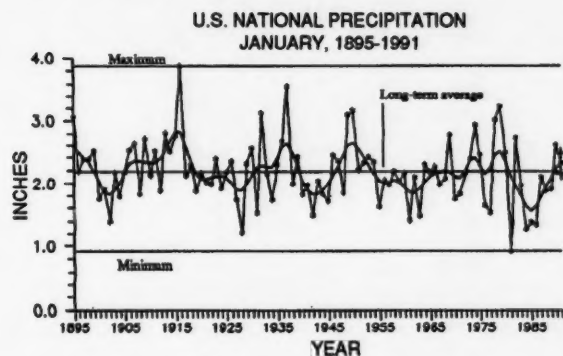


(From *Weekly Weather and Crop Bulletin* prepared and published by the NOAA/USDA Joint Agricultural Facility)

UNITED STATES JANUARY CLIMATE IN HISTORICAL PERSPECTIVE

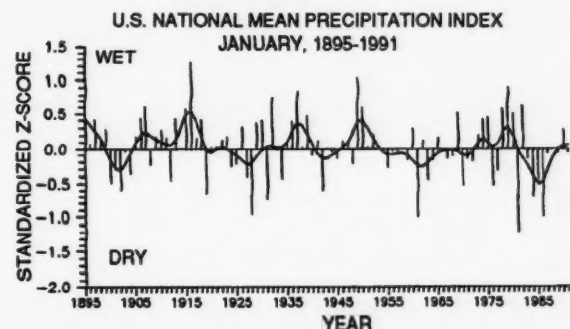
(From Climate Perspectives Branch, Global Climate Lab, NCDC, NOAA)

Preliminary data for January 1991 indicate that temperature averaged across the contiguous United States was slightly below the long-term mean. January 1991 ranked as the 32nd coldest January on record (the record begins in 1895). The 1991 value is based on preliminary data, which has been shown to be within 0.25° F of the final data over a 22-month period.



Areally-averaged precipitation for the nation was slightly above the long-term mean (graph above), ranking January 1991 as the 37th wettest (61st driest) January on record. The preliminary value for precipitation is estimated to be accurate to within 0.16 inches and the confidence interval is plotted in the graph above as a '+'.
 Historical precipitation is shown in a different way in the graph below. The January precipitation for each climate division in the contiguous U.S. was first standardized using the gamma distribution over the 1951-80 period. These gamma-standardized values were then weighted by area and averaged to determine a national standardized precipitation value. Negative values are dry, positive are wetter than the mean. This index gives a more accurate indication of how precipitation across the country compares to the local normal climate. The areally-weighted mean standardized national precipitation ranks January 1991 as the 38th driest January on record. The difference between the ranking of precipitation in the graph above and precipitation index in the graph below is due to the geographical distribution of seasonal precipitation (especially the unusually wet conditions in parts of the southeast).

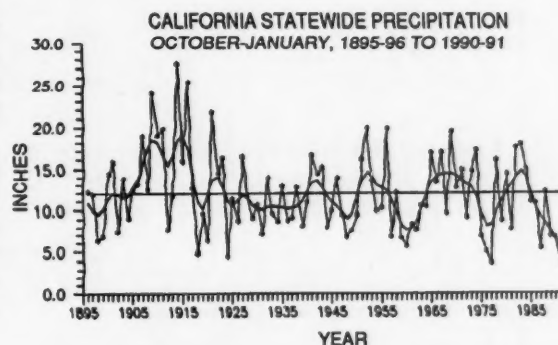
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About 42 percent of the country had above-normal precipitation in January 1991 and 58 percent had below-normal amounts. At the extreme ends of the scale, January precipitation over 13.4 percent of the country was much above normal, while 13.9 percent of the nation had precipitation much below normal. This reflects the sharp contrast in precipitation extremes that occurred this month. Regarding temperature departures, about 53 percent of the country was warmer than normal and 47 percent cooler than normal.

Precipitation departures followed a simple broad pattern, with the driest areas along the west coast and wettest areas along the Gulf coast. The West region had the fifth driest January on record and Northwest region the ninth driest January, while the Southeast region ranked second wettest. Temperatures across the country averaged in or near the middle third of the historical distribution.

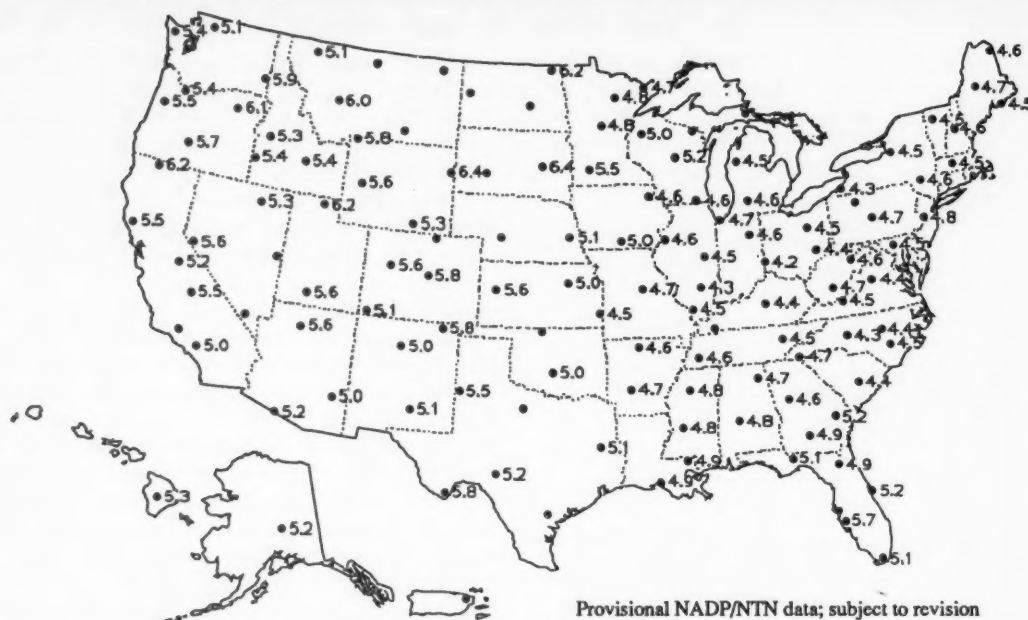
About a fifth of the contiguous United States continued to experience severe to extreme long-term drought during January 1991, while approximately a tenth continued severely to extremely wet. Seventeen other Januarys have had a larger drought area than January 1991. The severe drought area stretched mainly from the West to the northern plains, with conditions improving along much of the Gulf coast. Conditions are especially dry in California, which has experienced the driest October-January period on record in 1990-91. The filtered curve, which indicates long-term conditions, has also reached record low levels. If the rest of the rainy season is as dry as October 1990-January 1991, then California will have experienced its fifth consecutive dry October-April period.



Growing season precipitation for the Primary Hard Red Winter Wheat belt (extending roughly from Nebraska to the Texas panhandle) was below normal this year, with October 1990-January 1991 ranking as the 40th driest such period on record. This marks the third consecutive year with sub-normal precipitation during the first four months of the growing season and stands in sharp contrast to the extremely wet conditions of the mid-1980's.

According to preliminary data from the National Weather Service, there were 37 tornadoes across the United States in January 1991, which is well above the 1953-1990 average of 13 but is not a record.

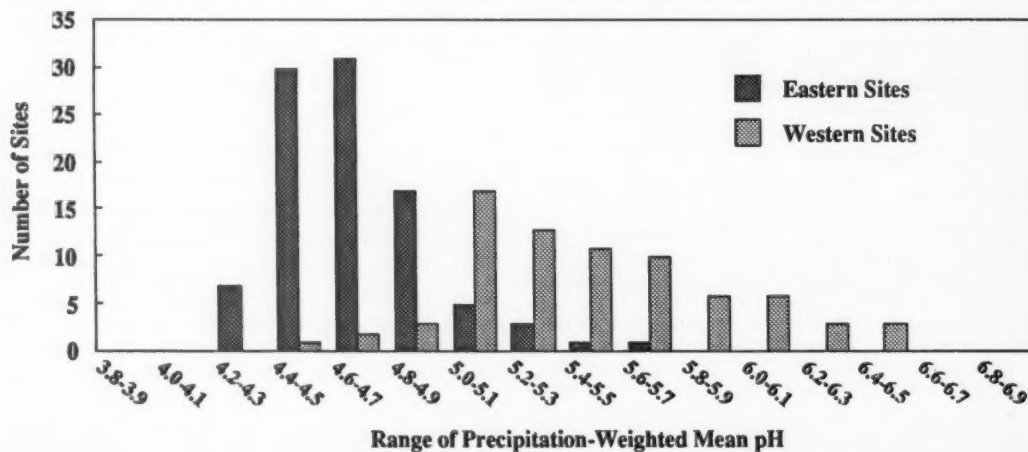
pH of Precipitation for December 24, 1990-January 20, 1991



Current pH data shown on the map (\bullet 4.9) are precipitation-weighted means calculated from preliminary laboratory results provided by the NADP/NTN Central Analytical Laboratory at the Illinois State Water Survey and are subject to change. The 127 points (\bullet) shown on this map represent a subset of all sites chosen to provide relatively even geographic spacing. Absence of a pH value at a site indicates either that there was no precipitation or that data for the site did not meet preliminary screening criteria for this provisional report.

A list of the approximately 200 sites comprising the total Network and additional data for the sites are available from the NADP/NTN Coordination Office, Natural Resource Ecology Laboratory, Colorado State University, Fort Collins, CO 80523.

Distribution of precipitation-weighted mean pH for all NADP/NTN sites having one or more weekly samples for December 24, 1990-January 20, 1991. The East/West dividing line is at the western borders of Minnesota, Iowa, Missouri, Arkansas, and Louisiana.



TEMPERATURE OUTLOOK FOR FEBRUARY-APRIL 1991



PRECIPITATION OUTLOOK FOR FEBRUARY-APRIL 1991



From *Monthly and Seasonal Weather Outlook* prepared and published by the National Weather Service

NATIONAL WATER CONDITIONS

JANUARY 1991

Based on reports from the Canadian and U.S. Field offices; completed March 11, 1991

TECHNICAL
STAFF

Thomas G. Ross, Editor
Judy D. Fretwell, Assistant Editor
Krishnaveni V. Sarma

COPY
PREPARATION

Thomas G. Ross
Krishnaveni V. Sarma
Kristina L. Herzog
Bernard A. Malo

GRAPHICS

Thomas G. Ross
Krishnaveni V. Sarma
Kristina L. Herzog
Judy D. Fretwell

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EXPLANATION OF DATA (Revised December 1990)

Cover map shows generalized pattern of streamflow for the month based on provisional data from 186 index gaging stations—18 in Canada, 166 in the United States, and 2 in the Commonwealth of Puerto Rico. Alaska, Hawaii, and Puerto Rico inset maps show streamflow only at the index gaging stations that are located near the point shown by the arrows. Classifications on map are based on comparison of streamflow for the current month at each index station with the flow for the same month in the 30-year reference period, 1951-80. Shorter reference periods are used for one Canadian index station, two Kansas index stations, and the Puerto Rico index stations because of the limited records available.

The **streamflow ranges map** shows where streamflow has persisted in the above- or below-normal range from last month to this month and also where streamflow is in the above- or below-normal range this month after being in a different range last month. Three **pie charts** show: the percent of stations reporting discharges in each flow range for both the conterminous United States and southern Canada, and also the percent of area in each flow range for the conterminous United States and southern Canada. The **combination bar/line graph** shows the percent departure of the total mean from the total median flow (1951-80) and the cumulative departure from median (in cfs) for all reporting stations (excluding eight large river stations indicated by * in the *Flow of large rivers* table) in the conterminous United States and southern Canada.

The comparative data are obtained by ranking the 30 flows for each month of the reference period in order of decreasing magnitude—the highest flow is given a ranking of 1 and the lowest flow is given a ranking of 30. Quartiles (25-percent points) are computed by averaging the 7th and 8th highest flows (upper quartile), 15th and 16th highest flows (middle quartile and median), and the 23rd and 24th highest flows (lower quartile). The upper and lower quartiles set off the highest and lowest 25 percent of flows, respectively, for the reference period. The median (middle quartile) is the middle value by definition. For the reference period, 50 percent of the flows are greater than the median, 50 percent are less than the median, 50 percent are between the upper and lower quartiles (in the normal range), 25 percent are greater than the upper quartile (above normal), and 25 percent are less than the lower quartile (below normal). Flow for the current month is then classified as; in the **above-normal range** if it is greater than the upper quartile, in the **normal range** if it is between the upper and lower quartiles, and in the **below-normal range** if it is less than the lower quartile. Change in flow from the previous month to the current month is classified as **seasonal** if the change is in the same direction as the change in the median. If the change is in the opposite direction of the change in the median, the change is classified as **contraseasonal** (opposite to the seasonal change). For example: at a particular index station, the January median is greater than the December median; if flow for the current January increased from December (the previous month), the increase is seasonal; if flow for the current January decreased from December, the decrease is contraseasonal.

Flood frequency analyses define the relation of flood peak magnitude to probability of occurrence or recurrence interval. **Probability of occurrence** is the chance that a given flood magnitude will be exceeded in any one year. **Recurrence interval** is the reciprocal of probability of occurrence and is the average number of years between occurrences. For example, a flood having a probability of occurrence of 0.01 (1 percent) has a recurrence interval of 100 years. **Recurrence intervals imply no regularity of occurrence**; a 100-year flood might be exceeded in consecutive years or it might not be exceeded in a 100-year period.

Statements about **ground-water levels** refer to conditions near the end of the month. The water level in each observation well is compared with average level for the end of the month determined from the entire period of record for that well. **Changes in ground-water levels**, unless described otherwise, are from the end of the previous month to the end of the current month.

Dissolved solids and temperature data are given for five stream-sampling sites that are part of the National Stream Quality Accounting Network (NASQAN). **Dissolved solids** are minerals dissolved in water and usually consist predominately of silica and ions of calcium, magnesium, sodium, potassium, carbonate, bicarbonate, sulfate, chloride, and nitrate. **Dissolved-solids discharge** represents the total daily amount of dissolved minerals carried by the stream. **Dissolved-solids concentrations** are generally higher during periods of low streamflow, but the highest dissolved-solids discharges occur during periods of high streamflow because the total quantities of water, and therefore total load of dissolved minerals, are so much greater than at times of low flow.

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DEPARTMENT OF THE INTERIOR
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